Rethinking food deserts: the practice and politics of food access

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Gerald Patrick Stertz Shannon

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Dedication

For Duane Tucker, who taught me in both poetry and puzzles

Abstract

Food deserts, low-income communities with low access to healthy, affordable foods, have received rapidly increasing attention in recent years from academic researchers, policy makers, and activists. Many studies have linked food deserts to increased rates of obesity and their related health consequences. Most recent research relies on spatial analyses which use physical distance from place of residence as a proxy for food access, focusing primarily on the supply of healthy foods into low income neighborhoods. However, this research has been founded on several questionable assumptions: that supermarkets are the best proxies for healthy food access, that access is best measured based on an individuals' place of residence, and that Euclidean distance is the best metric by which to measure food access.

This dissertation provides an alternative framework for studying food access that moves from measures of *proximity* to a focus on *everyday practices* of food procurement. Chapter 2 traces the emergence of food deserts as a concept, arguing that by seeking to diagnose and "cure" these pathological spaces, action based on this research is attempt to govern through the neighborhood environment, restoring social order to these problematic spaces. Chapter 3 relies on disaggregated data from the Supplemental Nutrition Assistance Program (SNAP) to understand how low-income individuals in the Twin Cities use their food assistance benefits. Chapter 4 builds on this analysis through a case study conducted in two Minneapolis neighborhoods. By asking participants to keep track of and reflect upon their daily mobility and food procurement, this case study shows how, where, and why neighborhood residents procure food. Together, these chapters emphasize the mobility of low-income residents and the frequency with which they shop and travel outside their neighborhoods, even when they lack consistent vehicle access. This research also emphasize the "grey spaces" of neighborhood food retail, especially discount grocers and ethnic markets that offer low prices or specialized goods, though these stores often have their own significant drawbacks. Chapter 5, the conclusion of the

dissertation, summarizes its findings, reflects on the unresolved tensions of its mixed methods approach, and suggests future research directions.

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Chapter 1

Introduction

1. Background

Generally defined as low-income communities lacking access to affordable, high quality foods, research on food deserts has increased rapidly in recent years. This work began in the United Kingdom in the late 1990s and rapidly spread to Canada and the United States (Larsen & Gilliland, 2008; Wrigley, 2002; Zenk, Schulz, & Israel, 2005). Rooted in an ecological model of public health, work on food deserts (and their theoretical cousins, obesogenic environments) moves away from public health interventions focused directly on individual behavior (Egger & Swinburn, 1997; Stokols, 1995). This research is more indirect in its approach, examining how neighborhood environments influence behavior and thus impact residents' health. In the case of food deserts, research has focused on the lack of stores offering a sufficient variety of low-cost fruits and vegetables. Left with only corner stores and fast food restaurants—and the nutritionally poor, highly processed foods they offer—residents of these neighborhoods are presumed to be at risk for higher rates of obesity and its related health consequences.

Despite its relatively recent invention as a term, food deserts have quickly caught the imagination of policy makers, activists, and food retailers. In the United States, a variety of initiatives at the municipal and state level have sought to attract new food options to areas labeled as food deserts, with New York and Pennsylvania being two prominent examples ("Going to Market: New York City's Neighborhood Grocery Store

and Supermarket Shortage," n.d., "Pennsylvania Fresh Food Financing Initiative," 2011). The 2008 Farm Bill specifically funded research on food deserts, resulting in a comprehensive report on the research and an online tool, the Food Environment Atlas, that maps food deserts in all 50 states (USDA Economic Research Service, 2009; USDA, 2011). Retailers including Wal-Mart, Target and Whole Foods have used food deserts as ways to justify their expansion into low-income areas (Bomey, 2013; S. M. Jones, 2011; Philpott, 2012). Neighborhood activists have also rallied around food deserts as an issue of "food justice," disproportionately affecting communities of color and a symptom of a more broadly dysfunctional and unjust food system (Alkon & Agyeman, 2011; Gottlieb & Joshi, 2010).

Despite the widespread adoption of food deserts as a mobilizing concept, recent research has found little correspondence between geographic food access and demonstrable health outcomes. Three recent studies, drawing on both longitudinal data and a meta-review, found no clear link between supermarket access and rates of obesity (An & Sturm, 2012; Boone-Heinonen et al., 2011; H. Lee, 2012). Other recent work has found that even low-income urban residents without consistent vehicle access often travel and shop outside their residential neighborhoods (Ledoux & Vojnovic, 2012; Zenk et al., 2011). Combined, this work has questioned the fundamental assumptions of current work on food deserts, particularly that individuals' food procurement and consumption practices are most influenced by the food retail options closest to their homes. Access to varying forms of personal transportation, the location of by friends and family, the

resources those social networks provide, and individuals' ability and inclination to travel to better food sources outside their areas all may also influence the ways low-income individuals get food.

This dissertation thus comes at a point when research on food deserts enjoys significant political and societal notoriety but also faces significant methodological and conceptual problems. This project uses this moment as an opportunity to rethink food deserts. Current approaches most commonly apply a spatial analytical approach, using GIS-based measures of store distance and density along with demographic data to identify marginalized populations at risk from poor food access. Aside from questions about the empirical validity of this approach, I argue that policy solutions informed by this research represent a spatialized form of "neoliberal paternalism" (Soss, Fording, & Schram, 2011). This governing strategy ties the economic and social troubles of low-income communities to their own morally suspect behavior, such as a low work ethic or, in this case, poor dietary decisions. By analyzing and reconstructing the "choice environment," policy solutions to food deserts seek to discipline neighborhood residents by transforming the retail landscapes, often through incentives used to lure large supermarkets back into these neighborhoods. This approach pathologizes food deserts, delimiting the problem of poor food access to the space within neighborhood boundaries and normalizing the presumably more functional food system elsewhere. The voices and practices of neighborhood residents are also notably absent from such analyses.

My research develops an alternative approach that addresses these issues. While most current approaches measures the *proximity* of healthy foods, this project focuses on everyday *practices* of food procurement and the social and environmental factors that shape them. In contrast to the former approach, which suggests interventions focused on improving the supply of food in low-income neighborhoods and often supporting the creation of new retail spaces, a focus on procurement practices highlights factors beyond Euclidean distance, specifically the role of transit networks and the social geographies of the city. While current analyses often assume residents to be immobile and largely passive subjects easily influenced by their environment, a practice based approach treats residents as mobile and active, using a variety of strategies and food sources in order to feed themselves and their loved ones. This project thus defines low-income neighborhoods not through the absence of retail investment but through the presence of already existing food sites and everday interactions between individuals and the food system within and beyond their neighborhoods.

While new supermarkets in low income communities certainly may bring economic and public health benefits, this research demonstrates that urban residents often travel elsewhere for food, often to the suburbs and even when large stores are present in their communities. This is due to the perceived better quality of suburban stores or their proximity to friends and/or family. My research also points out the underrecognized role played by already existing smaller retailers, including discount and ethnic grocers. While residents have concerns about these stores—food quality in the case of discounters and

price in the case of ethnic grocers—they also value the prices and selection these stores provide and find them more accessible than large supermarkets. In sum, this research project suggests the need for a more complex and less dichotomous analysis of urban food environments, one that focuses on the variety of ways low-income residents interact both with their neighborhoods and the larger city.

2. Study setting and methods

The research for this project was done in the Twin Cities of Minneapolis and St. Paul, MN. Using conventional approaches, a significant part of this region does experience poor food access. Of the 991,771 low-income people living in tracts classified as urban in the USDA's food environment atlas, 157,347 of them (roughly 16%) of them lived in tracts also classified as having low food access (USDA, 2011). The Twin Cities have a diverse system of food distribution. It hosts several major grocery chains include Rainbow Foods and Cub Foods, as well as upscale retailers Whole Foods, Lunds, Byerly's, and Kowalski's. Both Wal-mart and Target have several "supercenters" in the region, stores which combine full grocery selection with other retail items. Aldi and Trader Joe's have also expanded into the area in the last decade. The region has several alternative/sustainable food options, including a network of community gardens, community supported agriculture (CSA) providers, food cooperatives, and farmers' markets. Both Minneapolis and St. Paul have been active in pursuing strategies to improve the quality and accessibility of food found within their areas, including analysis

of existing store locations, strategies to support urban agriculture, the creation of "mini" farmers' markets scattered throughout the city, and efforts to improve the quantity and selection of fruits and vegetables at corner stores. The diversity and active policy environment of this metropolitan area provide an excellent setting in which to conduct this research.

My dissertation uses a mixed methods approach designed to combine the broad scale and analytic capabilities of GIS with the nuance and depth of qualitative approaches. In doing so, it draws upon previous work in critical GIS that attempts to meld GIS software with qualitative methods and epistemologies (Cope & Elwood, 2009; Mei-po Kwan, 2008; O'Sullivan, 2006; M. Pavlovskaya, 2006). Unlike proponents of a "qualitative GIS," however, this study has used quantitative GIS methods in tandem with a largely qualitative case study. The goal has been to search for areas of agreement and of tension, with the latter illustrating the epistemological limits and biases of each approach. For example, while GIS analyses have often relied on dichotomous patterns of store classification (e.g., supermarkets and fast food as proxies for healthy and unhealthy foods), my case study participants often described substantial variation in the ways they viewed supermarkets, with some clearly providing better food options than others. The triangulation provided by using both approaches provides a more sophisticated, if not always entirely clear, picture of how food access if practiced on the ground.

More specifically, my research was done in two main phases. In the first section, I analyzed data from the Supplemental Nutrition Assistance Program (SNAP, formerly

known as food stamps). I acquired monthly data on SNAP benefit distribution to clients and redemption at area stores for fiscal year 2010. This data was available at the zip code level, a scale that may be useful for statewide analysis, but presents problems at the neighborhood scale. For example, food retailers are often located on commercial arteries that form zip code boundaries, making data on SNAP redemptions at that scale highly susceptible to boundary effects. To address this issue, I adapted existing dasymetric mapping techniques to create disaggregated estimates of both datasets (Eicher & Brewer, 2001; Mennis, 2003). The results of this analysis were (1) estimates of SNAP benefit distribution based on a 500 km grid and (2) store level estimates of SNAP redemptions. Using these data, I identified eight areas with particularly high densities of SNAP clients and calculated the patterns of benefit distribution and usage in each of those eight areas (figure 3.4). Because these data are held in two differing computer systems, it is currently impossible to track how benefits are used by a given group of participants. I was however, able to compare the levels of benefits received in a given area to those spent there. The methods used for this analysis are described in more detail both in chapter 3 and in a separate publication (Shannon & Harvey, 2013).

The second phase of my research focused on two communities identified through the above analysis, north and south Minneapolis (figure 4.1). These areas provided contrasting levels of food access, with south Minneapolis having almost three times as many stores as the northside. The two communities shared similar levels of diversity and median income, however. Within each neighborhood, I recruited participants to

participate in a five day study of their daily mobility and food procurement. I used a quota sampling method for this study, recruiting African-American, white, and immigrant groups in each neighborhood (Latinos in south Minneapolis and Hmong in north Minneapolis). During the five day study period, these participants (n=38) carried a cell phone with them that regularly tracked their daily mobility. They also used this phone to take pictures of the places where they procured food and the food they procured. Participants kept a food shopping diary listing all their shopping trips. An initial interview before the study period included a brief survey on participants' general food shopping behavior. A final, semi-structured interview involved more detailed questions about participants' activity during the study period as well as discussing other stores they often visited and other sites they chose not to use.

Together, the goal of these two approaches was to provide both breadth and depth in understanding how and where low-income populations get food. Both had significant limitations. SNAP data cannot track the shopping of individuals or even of groups within a given area, and it provides no evidence about why individuals use SNAP benefits in the way they do. SNAP benefits are also only a portion of an individuals' total food shopping and so provide only a partial view. Case study participants provided much more perspective on why benefits were used as they were, but given the small sample size, it is difficult to generalize from just these interviews. Taken together, though, these two arms of my research project reinforced each other and highlighted several common themes,

most notably the diversity of stores available in low-income neighborhoods and the surprising mobility of their residents.

3. Chapter organization

This dissertation is organized around three main chapters. In chapter 2, I trace the intellectual origins of food deserts, tracing its conception to three main intellectual threads. First, beginning the late 1960s, public health practitioners and epidemiologists became increasingly interested in social ecology as an explanatory framework for public health. In this model, the cause of individual pathology is not traced directly to that person's genetic makeup or personal behaviors. Rather, the contextual environment that acts upon that person and shapes her/his behavior is seen as the main driver of health outcomes. This shift moved attention away from efforts toward individual behavioral change and toward community level interventions. Second, rapidly rising rates of obesity in the 1980s prompted alarm over an obesity "epidemic" and its related health outcomes, such as diabetes and heart disease. This attention continues, even though obesity, as measured through the body mass index (BMI), may have a more tenuous connection to health outcomes than many claim. The identification of obesity as the core problem, I also argue, implicitly stigmatizes low-income neighborhoods and communities of color. Lastly, food deserts as a concept became popular at a time when GIS software and other mapping tools were becoming ubiquitous in many disciplines and organizations. The easy ability of GIS to quickly map and analyze data on store locations made food deserts, a

spatially bounded area of the city, an easy problem for GIS analysts and policy makers to target. The confluence of these three trends, I argue, results in a spatialized form of "neoliberal paternalism," a strategy that seeks to reform costly and morally suspect eating behaviors by reshaping the environment in which residents make food decisions (Soss et al., 2011). The conclusion of this chapter describes several alternatives for studying food access, including critical GIS and political ecology.

Chapter 3 of this dissertation focuses directly on my analysis of SNAP data for the Twin Cities metropolitan area. Most research on food deserts has until now focused on the location of foods and major retailers, with a resulting policy focus on improving the supply of foods to low-income neighborhoods. This chapter joins a handful of other studies in questioning this approach, particularly its assumption that individuals are most influenced by the food environment around their place of residence. By comparing the distribution of SNAP benefits to their redemption at area stores, this analysis finds an almost uniform "outflow" of SNAP dollars from low-income communities. This demonstrates that low-income residents can and often do travel elsewhere to use benefits, even when supermarkets are present within their communities. These results emphasize the need to more fully incorporate patterns of daily mobility into analyses of food access. In addition, supermarkets play a significantly less prominent role in low-income neighborhoods than they do in the metropolitan area as a whole. A category I term mid-sized grocers—made up primarily of ethnic retailers and discount grocers—makes up a major part of this gap. Most reports on SNAP usage have focused on the program's

impact on both health and household food security. This study demonstrates that SNAP data can also be a helpful resource for understanding the interactions between neighborhood residents and their neighborhood food environment.

Chapter 4 continues the development of the findings from the third chapter, using data from the neighborhood case study to ask what might be missing from conventional analyses of food access in low-income neighborhoods. As was the case in the analysis of SNAP data, my case study participants routinely travelled out of their neighborhoods to do their food shopping, particularly at supermarkets, which made up the largest single source for their food. In north Minneapolis specifically, participants saw their local supermarket as significantly poorer in quality that those in other areas, describing higher prices, lower customer service and food quality, and a neighborhood environment that many wanted to avoid. Mid-sized grocers, particularly the discount grocer Aldi, played a significant role for many participants due to its low prices. Concerns about food quality at these stores made some refuse to shop there, however. In contrast to dichotomous healthy/unhealthy store classifications, I found that both supermarkets and mid-sized grocers often act more as "gray spaces," provoking ambivalent reactions from the participants I worked with. The mobility of these residents, even those without vehicles, was one last strong theme from this research. Participants often travelled several miles on their food shopping trips, either because of available transit options, the presence of friends or family elsewhere, or the perceived better quality of food options outside their neighborhoods. Rather than assuming that low-income households are trapped in their

neighborhoods, I suggest that future work to improve food access might more fruitfully build upon the resources and mobility these populations already possess.

Chapter 5 summarizes the findings of this project and points toward future research in this area. Given their political saliency, it is difficult to dismiss ongoing policy and research attention given to food deserts. Rethinking them, however, involves placing food deserts in their broader economic and social context. Rather than simply building new large retail developments or encouraging the spread of farmers' markets, work on food deserts might fruitfully partner with other efforts toward equitable development, including a focus on enhancing transit options by shaping routes more clearly around major food sources, work around equitable mixed use/mixed income development, or prioritizing resources aimed at strengthening the social and economic capital of marginalized communities. These are certainly not easy tasks, but they are ones that may be necessary if creating healthier, more sustainable urban neighborhoods is to be a primary goal.

Chapter 2

Food deserts: Governing obesity in the neoliberal city

1 Introduction

At their January 2012 meeting, the United States Conference of Mayors announced the formation of a Food Policy task force (Shute, 2012). The chairs of this group, Thomas Menino of Boston and Stephanie Rawlings-Blake of Baltimore, pledged work on a range of issues, including input on the U.S. farm bill, stronger local food systems, and improved food access (Boston Mayor's Office, 2012). This task force reflects a rising interest in food system governance by public officials in the U.S., Canada, and United Kingdom at several levels over the last decade. In the specific case of food access, much recent action has focused on so-called "food deserts," low-income areas in which healthy foods are expensive, of poor quality, or inaccessible, thus contributing to rising rates of obesity and diet-related chronic disease. One statewide project, the Pennsylvania Fresh Food Financing Initiative, provided funds for new grocery stores in underserved rural and urban areas in the mid to late 2000s. It has been singled out by the Obama administration, which at the time of this paper is pushing for a $400 million initiative at the national level modeled after the program. Similar initiatives to incentivize new food retail are already underway in several other states ("Pennsylvania Fresh Food Financing Initiative," 2011).

This paper argues that current food desert research can be historically situated at the intersection of three lines of research. First, interest in food deserts draws from a body of work seeking to "place" public health in a geographical context (Kearns & Moon, 2002; Brian King, 2009). Beginning in the late 1960s, public health research increasingly questioned the commonplace focus on educational efforts to change individual behavior. Instead, increased interest in a social ecological model placed more emphasis on the neighborhood environment as a driver of health related behaviors (Emery & Trist, 1972; Stokols, 1995). Work in this area has advocated for interventions designed to "cure the environment" (Hill & Peters, 1998, p. 1373) and stem public health problems.

Second, a dramatic rise in rates of obesity beginning in the late 1980s created deep concern about an obesity "epidemic," particularly among low income populations. Public health officials encouraging action to reduce obesity cited the health risks of obesity as well as the high costs of treating diet related disease (Gallagher, 2006; Seidell, 1998; Wolf & Colditz, 1998). The consumption of sugar laden drinks, highly processed snacks, and fast food has been most closely linked to this trend. The comparative abundance of such foods in low income urban neighborhoods, combined with a corresponding lack of fresh produce and other healthy foods, has led to research on the role of "obesogenic environments" and food deserts in causing obesity.

Third, research on food deserts has relied heavily on spatial analyses utilizing geographic information systems (GIS). The majority of current studies analyze the distance to and density of healthy and unhealthy food stores within particular

communities, comparing the accessibility of healthy foods against underlying demographics (Beaulac, Kristjansson, & Cummins, 2009). The maps that result from this research, including the U.S. Department of Agriculture's own Food Desert Locator[1], present food deserts as areas with clearly defined boundaries and a more or less uniform definition. The conception of both food deserts and urban spaces provided by increasingly ubiquitous GIS software provides clear goals for spatial governance, allowing non-profits, community groups, and policy makers to propose solutions targeted at problematic areas.

This paper argues that the combination of these three lines of research—public health's embrace of social ecology, anti-obesity efforts, and GIS enabled neighborhood analyses—marks food desert work as a distinctive form of neoliberal governance. Rather than simply fostering self-governing individuals (Braun, 2007; Rose, 2001), food desert work is more indirect, focusing on the creation of environments that in turn encourage healthy behaviors. Though ostensibly designed to reduce stigma on individuals, these projects pathologize low-income communities—and their residents, by extension—by locating the cause of obesity within their geographic boundaries. Food deserts, and efforts to utilize urban design to reduce obesity more generally, can thus be read as an expanded, spatialized form of "neoliberal paternalism" (Soss et al., 2011), a set of policies meant to restore social order to dysfunctional communities and "mismanaged lives" (W. Brown, 2005, p. 42). Furthermore, by normalizing middle-class "foodscapes" as a model for low-

[1]This tool is available at http://www.ers.usda.gov/data-products/food-desert-locator.aspx

income areas, projects combating food deserts close off a more systemic interrogation of both food production systems and processes of urban economic and racial segregation. The paper concludes by considering how alternative approaches, including work in political ecology and critical GIS, suggest alternative approaches that may avoid the above pitfalls.

2 The rise of social ecology

Social ecology came to prominence during a roughly two decade period beginning in the late 1960s (Binder, 1972; Bronfenbrenner, 1979; McLeroy, Bibeau, Steckler, & Glanz, 1988)[2]. Its early roots are in the Chicago School and its focus on applying ecological methods used to study natural ecosystems to human communities. Early human ecology stressed the importance of economic and biological processes in shaping human communities, but proponents of a *social* ecology have included social structures more explicitly in their analyses, such as relational networks and civic institutions (Alihan, 1964; Binder, 1972). In health, social ecology began as a critique of approaches which focused on individuals as discrete actors, emphasizing instead the contextual factors which shape behavior. In doing so, it represents a mode of governance somewhat different from the standard goals of neoliberal governmentality (Foucault, 1991; Rose, 2001). Rather than creating self-governing individuals, social ecology

[2] While the same term was also used by Murray Bookchin to describe his communalist vision of nature-society relations (Bookchin, 1990), "social ecology" as described here has a different lineage with a less radical political message. The two do share an interest with the Chicago school in an ecological framing of social relations.

governs individuals through changes to their everyday environment, shaping behaviors by changing the "choice landscape" of a given neighborhood.

Early work in social ecology emphasized holistic analyses of human behavior. Prizing the goal of "living spaces conducive to the achievement of optimum human satisfaction" (Binder, 1972, p. 906), this early work advocated multi-scalar analyses, understanding how environmental factors affect human behavior, emphasizing "individual adaptation, adjustment, and coping" (Moos, 1976). Catalano (1979), for instance, studied how the stress and air pollution that characterizes working class urban housing leads to lower disease resistance, critiquing a purely germ based explanation of sickness focused only on individual bodies. Bronfenbrenner's ecological theory, developed in the late 1970s, conceptualized the social environment as a series of concentric spheres, ranging from the microsystem of home, neighborhood, and family to the macrosystem of culture, values, and laws within a community (Bronfenbrenner, 1979, 1989). The focus on individuals as organisms constantly adapting to their environment was key to this line of thought, an alternative to treating individuals as discrete rational actors. As one early author stated bluntly, the latter approach "instructs people to be individually responsible at a time when they are becoming less capable as individuals of controlling their total health environment[….]What must be questioned is both the effectiveness and the political uses of a focus on life-styles and on changing individual behavior without changing social structure and processes" (Crawford, 1979, p. 256).

For social ecologists, neighborhoods deserved recognition as actors in their own right, not only as a container for individuals with similar characteristics. More recently, this is evident in studies focused around neighborhood effects on health, which has broadly considered the role of both *context* (the characteristics of a given area) and *composition* (the traits of its population) on health outcomes. The effects of social class on health, for example, are not just seen in demographic characteristics such as levels of education or household income. Rather, low-income neighborhoods affect health independent of these individual traits: "In the same way that education, occupation, income, and/or car ownership may be mediating factors in the relationship between social class position and health, so too social, economic and cultural features of areas may be some of the mediating factors in the relationship between class and health" (Macintyre et al., 1993, p. 219). Some recent work in this area by Macintyre and others has also called for more complex understandings of the relationship between populations and their environment, questioning the efficacy of the context/composition distinction (Cummins, Curtis, Diez-Roux, & Macintyre, 2007; Macintyre, Ellaway, & Cummins, 2002). Still, by consistently concentrating on the relationship between people and their neighborhoods, social ecology has supported research that places public health in its geographical context.

While social ecology has been an effective critique of individual-focused interventions, it has its own problematic areas. Because of its increased emphasis on place, as McLeroy et al. (McLeroy et al., 1988) have stated, "The [ecological] model

assumes that appropriate changes in the social environment will produce changes in individuals"(p. 351). Despite Bronfenbrenner's insistence that individuals should be viewed "not merely as a tabula rasa on which the environment makes its impact, but as a growing, dynamic entity that progressively moves into and restructures the milieu in which it resides" (1979, p. 21), much social ecological work has treated the environment-individual relationship as a unidirectional one. For instance, the use of multilevel models to measure neighborhood influences on health behaviors implies a strictly one-way relationship (Black, Macinko, Dixon, Fryer, & Fryer, 2010; Inagami, Cohen, Brown, & Asch, 2009). Such an approach precludes attention to the complex, endogenous processes that connect individuals and neighborhoods. As one example, Guthman (2011) has recently critiqued research on obesogenic environments for failing to consider how both the production of such neighborhoods and individuals' decisions to live in them may both be part of a broader process of class formation.

Another problematic area of this work is the sharp dichotomy between neighborhood residents, treated as largely predictable organisms responsive to their environment, and analysts who with a "view from above" (Haraway, 1988, p. 589) provided by large datasets can engineer this environment to improve the overall health of the population. This perspective often misses the complexity and significance of everyday practices (Scott, 1998). This power differential between analyst and organism, combined with a focus on optimal health, resonates with Foucault's description of neoliberal governmentality and its efforts to produce self-governing citizens whose

conduct optimizes the general welfare of the state. While much of Foucault's work examined particular spaces dedicated to the disciplining of deviant bodies at specific sites, such as the school, hospital, army, or prison (Foucault, 1995), social ecology focuses on the manipulation of the physical and social environments in which individuals live.[3] By focusing instead on the neighborhood environment, social ecologists could shift the behavior of the population.

By the late 1990s, social ecology had secured a firm footing within public health research. Daniel Stokols' much cited 1995 article applying social ecological principles to research on community health placed the former framework alongside existing approaches as first among equals. Rather than attempting to justify social ecology's place in health research, Stokols provided several principles for its application, such as the need to "enhance the fit between people and their surroundings" (p. 288). This article, and others like it, presented social ecology as essential lens for understanding the health of communities (Egger & Swinburn, 1997; Macintyre et al., 1993; Swinburn, Egger, & Raza, 1999). For researchers particularly concerned about rising rates of obesity, social ecology was a particularly promising analytical tool.

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[3] In *The Birth of Biopolitics* (2008), Foucault does briefly refer to a similar type of spatial governance, which he refers to "new techniques of environmental technology or environmental psychology" (p. 259) which motivate individuals to particular forms of action by means of incentives in their environment. Unfortunately, this is a subject to which Foucault never returns.

3 Curing the obesogenic environment

Researchers studying rising obesity rates increasingly saw social ecology as an alternative to traditional epidemiological approaches. In the U.S., rates of obesity (measured by a body mass index, or BMI, of over 30) increased from 15% in the late 1970s to 30.9% at the end of the 1990s (Flegal, Carroll, Ogden, & Johnson, 2002). The effectiveness of behavioral approaches to reducing obesity had been questioned by empirical studies since the late 1970s, and these rising rates only further contributed to this skepticism (Garner, 1991). By the late 1990s, several authors had applied social ecology specifically to this issue by studying the potential role of so-called "obesogenic environments" (Egger & Swinburn, 1997; Swinburn et al., 1999). As one piece framed this approach, "To combat the epidemic of obesity, we must first *cure the environment*" (Hill & Peters, 1998, p. 1373, emphasis added). In keeping with Bronfrenbrenner's multiscalar framework, an early review framed environmental influence in broad terms, including automobile sales, fast food advertising, and television viewing time (French, Story, & Jeffery, 2001). Swinburn, Egger, and Raza's ANGELO framework explicitly classifies research in this area by its scale (micro or macro) and domain (physical, economic, political, and sociocultural) (Swinburn et al., 1999). Using this framework, certain environments, broadly defined, can be labeled as either obesogenic or, conversely, "leptogenic" based on their tendency to work against or promote healthy weights in individuals.

Work on obesogenic environments has exploded in the last decade, with a 2010 review finding nearly 150 published studies addressing it in some form (Kirk, Penney, & McHugh, 2010). These studies are most common in the United States and United Kingdom, with smaller bodies of research in other Anglophone countries (Hemphill, Raine, Spence, & Smoyer-Tomic, 2008; Hinde & Dixon, 2005; Spence, Cutumisu, Edwards, Raine, & Smoyer-Tomic, 2009). Studies have counted the number of neighborhood amenities present within a buffer around low-income housing (R E. Lee, Reese-Smith, Regan, Booth, & Howard, 2003), reported on self-reported feelings of safety (Timperio, Salmon, Telford, & Crawford, 2005), and created disparity indexes based on census data (Black et al., 2010). In most cases, the results of these neighborhood analyses analyzed along with rates of obesity drawn from large scale community surveys. Policy drawing from this research has pushed for improvements to school lunches, safer and more walkable environments, and greater regulation of food advertising and nutritional claims to improve the environment in which individuals make dietary decisions (Sallis & Glanz, 2009; Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008).

Research in this area has concentrated on the failure of both governments and corporations to provide equitable access to neighborhood amenities. However, policy solutions based on this research tend to fixate primarily on the neighborhood scale. Sallis and Glanz (2009) list several such initiatives, noting one California program's efforts "to demonstrate that by transforming the food and physical activity environments of resource-poor, low-income communities, it is possible to change norms that foster

unhealthy food choices and inactivity" (p. 141). Another similar effort in the U.S. includes as goals: "installing bike racks, getting more fruits and vegetables on the shelves of corner stores, building walking paths and bike trails, supporting school cafeteria reforms, offering physical education in schools, and making health considerations part of planning and development decisions" (p. 141). Responses in the United Kingdom have been broadly similar, with a focus on creating spaces for urban agriculture, strengthening local food systems, and ensuring safe environments more conducive to physical activity are found in all neighborhoods (Ashton, Gillespie, & Dawson, 2010; Greater London Authority, 2013). The goal of these projects is thus engineering the ideal physical environment, one where healthy eating and physical activity are the most accessible and attractive choice.

While these initiatives have value, the focus on neighborhood space minimizes the place of structural reform. While some authors suggest reforming the practices of large food producers, processors, and distributors, political efforts to do so have encountered greater political resistance and achieved more modest results (Rebecca E Lee, McAlexander, & Banda, 2011; Malhotra, 2012; Nestle, 2002). Similarly, while studies have found links between perceived neighborhood safety and physical activity, few policy responses have connected obesity with efforts to lessen the economic and racial segregation that may contribute to high crime rates (Cutts, Darby, Boone, & Brewis, 2009; Franzini et al., 2010; Peterson & Krivo, 2010). Certainly, metrics which both identify problems and assess solutions are more difficult to create at a systemic

level, complicating efforts to argue for political action at a larger scale. Still, the disjuncture between research and policy in this area is worth noting.

The identification of obesity as core problem in work is also itself problematic. The use of individuals' BMI, for example, has been questioned even within public health for its sometimes questionable correspondence with health outcomes (Evans & Colls, 2009; Franzosi, 2006; Guthman, 2011). While recent studies pay more attention to the influence of the physical and social environment, action to reduce obesity and promote healthy eating (variously defined) still stigmatizes fat bodies in what Rawlins (2008) terms "body fascism" (p. 138, see also Guthman, 2007; Longhurst, 2005). Evans et al. (2012) argue that anti-obesity educational programs now exist alongside efforts to create healthier environments, making clear which bodies are desirable in urban redevelopment and which are to be "designed out."

Obesity also can act as a marker of both class and racial distinction, normalizing fit, white, and middle class bodies against non-white and/or poorer fat bodies lacking the self-control or ability to responsibly govern themselves. In her review of research on food and race, Slocum (2010) notes the tendency to conflate race, obesity, and poor eating habits in both health and alternative food efforts. This tendency is especially acute in the United States, where rates of obesity differ most sharply across racial groups (P. Clarke, O'Malley, Johnston, & Schulenberg, 2009; National Obesity Observatory, 2011). Whatever correlations exist between self-identified race and rates of obesity, though, to argue that this relationship is the result of collective socialization, a lack of social capital,

or culturally specific foodways pathologizes already marginalized populations (Boardman, Onge, Rogers, & Denney, 2005; Franzini et al., 2010; Herrick, 2008).

This is true of social class as well. When celebrity chef Jamie Oliver's televised "food revolution" targeted the working class white community Huntington, West Virginia, it leveraged the shame individuals felt at their body status to encourage healthier eating, rather than the conditions that encouraged consumption of highly processed foods (Slocum, Shannon, Cadieux, & Beckman, 2011). As another example, a planning document from the UK city of Westminster advocating for increased governmental action on public health suggests tying welfare benefits to compliance to exercise programs proscribed for weight reduction, explicitly targeting low-income populations ("Obese who refuse to exercise 'could face benefits cut'," 2013). At the neighborhood level, as Guthman (2011) has argued, the amenities most often promoted in anti-obesity policy—parks, bike trails, walkable streets, healthy food retailers—are most often found in upscale urban neighborhoods. Anti-obesity and healthy eating efforts thus connect with neighborhood gentrification and the social reproduction of self-managing individuals (see also Pudup, 2008).

In research on obesogenic environments, then, race and class can easily become conflated with neighborhood space. Herrick's (2008) study of an anti-obesity effort in Austin, Texas notes how high rates of obesity on the city's predominantly Hispanic east side resulted in the "elision of Hispanic and East Austin under the banner of 'high risk'" (p. 2730), medicalizing racial and class based inequalities. While Herrick focuses on the

ways that the Austin project worked with and targeted individuals, a similar point could be made about efforts that draw from social ecology's emphasis on environmental change. By stigmatizing neighborhoods as "obesogenic," anti-obesity programs legitimate reinvestment and neighborhood redevelopment meant to encourage healthier forms of life, "reinstrumentalizing" neighborhood space to produce desirable bodies that place few demands upon the state (Herrick, 2009). This "spatial pathologization" (Craddock, 2000, p. 10) targets areas as much as bodies, seeking to quarantine threats to the general health, destroy their source, and create healthier solutions in their place. This governance of bodies demonstrates what some authors have called the biopolitical tendency of anti-obesity efforts, their work to produce forms of life that are politically and economically productive (Evans & Colls, 2009; Julier, 2008; J. Wright & Harwood, 2009).

In coalescing around obesity as a major health threat, policy makers have sought to govern bodies in ways that reduce obesity's perceived negative social and financial costs. While anti-obesity efforts often champion a positive message of health promotion, they also necessarily include a stigmatization of obese bodies and the spaces that produce them, a process that conflates obesity with non-normative class and/or racial identities. Neighborhood redevelopment intended to eliminate obesity generating factors may be well intentioned, but in its emphasis on recreating the normative spaces of middle class communities (e.g., green space, walkability, and new retail), it can act as a pathway to gentrification. The increasingly common use of GIS in this research, discussed in the next

section, is a third piece of this puzzle, as it locates and bounds food problems within specific pathologized spaces.

4 Putting food deserts on the map

Food deserts are perhaps best understood as a subset of research on obesogenic environments. In contrast to the latter, which may be found in middle class suburbs as well as core urban areas, food deserts explicitly include low household incomes as a definitional criterion. In addition, obesogenic environments work emphasizes the abundance of obesity promoting environmental features, while food deserts are defined by a lack of healthy food options. Still, the two concepts share a common ideological heritage: emerging work in public health on social ecological models of obesity.[4]

The term food desert came to prominence through UK government sponsored studies in the late 1990s (Cummins & Macintyre, 2002). The first major academic studies on British food deserts were published by geography and public health researchers in a 2002 edition of *Urban Studies* (G. Clarke, Eyre, & Guy, 2002; Cummins & Macintyre, 2002; Whelan, Wrigley, Warm, & Cannings, 2002; Wrigley, 2002). Consistent with broader Third Way policies, initiatives focused on food deserts worked from a model of "the state as enabler, or the state as animator" (Rose, 2000), incentivizing the relocation

[4] Research on food access, of course, has a long history. In the United States, Progressive era settlement houses, community gardens, school lunch programs, and anti-poverty programs have all tackled the perceived inaccessibility of food to low-income populations (Caplovitz, 1967; Lawson, 2005; Levine, 2008; Poppendieck, 2010; Shapiro, 1986). By specifically encouraging private sector solutions to encourage healthy consumer choices, food deserts are a neoliberal addition to this history.

or renovation of private food retailers and encouraging the work of non-profits working on alternative food projects including community gardens.

Though the study of food deserts was first popularized in the United Kingdom, the United States has not lagged far behind. Several notable U.S. studies were published only a few years after the first in the U.K. (Block, 2006a; Zenk, Schulz, & Israel, 2005). The 2008 U.S. Farm Bill contained a provision specifically mandating study of food deserts, and in 2010 First Lady Michelle Obama introduced the Healthy Food Financing Initiative, designed to "to eliminate food deserts across the country within seven years" (U.S. Department of Heath and Human Services, 2010). Retailers including Wal-Mart and Target have argued for access to core urban markets in part by framing their stores as the solution to food deserts (D'Innocenzio, 2010; S. M. Jones, 2011). Conversely, neighborhood activists and non-profit agencies have used food desert research to frame the need for increased urban agriculture and the development of small, community based enterprises, framing them as an issue of food justice (Bybee, 2009; Smith, 2012). The vast majority of work on food deserts has focused on urban neighborhoods, though a small but growing set of studies do consider rural communities (Hubley, 2010; McEntee & Agyeman, 2010). Work on food deserts has to this point been almost completely confined to Anglophone countries (Battersby, 2012).

Methodologically, most research on food deserts has followed one of two tracks, what one recent review termed either *market basket* or *geographic studies* (Beaulac et al., 2009). Early research largely used the market basket approach, in which all food stores in

low and/or moderate income neighborhoods are surveyed for the price, amount, and quality of certain healthy foods. Comparison across store types and neighborhoods identifies how the accessibility and affordability may differ. Cummins and Macintyre (2002), for example, measured the prices of 57 different food items in several Glasgow neighborhoods, concluding that store types were the best predictor of food prices, though stores in which processed food was cheapest were most common in low income areas. Block and Kouba's (2007) study in Chicago also found lower prices in suburban Oak Park compared to Austin, a low-income urban neighborhood.

Recent work falls more commonly into the category Beaulac et al. (2009) term "geographic studies." These analyze the proximity and density of retail food outlets in specific neighborhoods, often but not always focusing on supermarkets as markers of access to affordable, healthy food. Zenk et al. (2005) were one of the first to use this method of analysis, computing the distance between the centroid (center point) of Detroit neighborhoods and major supermarkets, which often function as a proxy for cheap, healthy foods. By regressing this measure on race and income data for these neighborhoods, they highlighted several areas with low access to healthy food. Subsequent studies have combined several such measures, such as distance to the nearest store and number of stores within a certain buffer distance (Apparicio, Cloutier, & Shearmur, 2007; Larsen & Gilliland, 2008). Those areas which combine poor access to large food retail with high measured social disparities are marked as food deserts. These methods continue to be refined, with one recent project combining market basket and

geographic studies to map the "nutritional terrain" (Goldsberry, Duvall, Howard, & Stevens, 2010).

On a practical level, the recent popularity of geographic food desert studies has been aided by the increasingly common use of geographic information systems (GIS) technology by geographers and non-geographers alike. The adoption of ESRI's desktop software ArcGIS by many academic institutions and planning agencies over the last decade has eased the process of spatial analysis for many researchers. By combining listings of food retailers from private databases with publicly available demographic data, an analysis of the distance to and density of neighborhood food stores is now a relatively simple project. Online maps of food deserts are now available from both the USDA and PolicyLink, a national non-profit focused on equitable development[5].

As a result, GIS-based analyses have made food access calculable in a spatial sense, defining the boundaries of at-risk neighborhoods at a fine scale. They present a god's eye view representing food deserts as objective, calculable spaces rather than as sites of everyday practices (De Certeau, 1984; Haraway, 1988; Scott, 1998). These maps are also easily translated into action. PolicyLink's maps of limited access are created to allow policymakers to easily target areas where new retail development should be prioritized (Treuhaft & Karpyn, 2010). Gallagher's (2006) much publicized analysis of food deserts in Chicago goes further, fixing the stakes of fixing food deserts at years of life lost to neighborhood residents and campaigning for more supermarkets as a way to

[5] PolicyLink's map of limited supermarket access is available at http://www.policymap.com/maps.

reclaim those lives. In contrast to market basket studies, which focus on the presence, quality, and price of particular foods, geographic studies treat stores as proxies for the foods they carry, uniformly endorsing large supermarkets as the best solution to poor food access.

In this way, the preponderance of current research on food deserts treats them as discrete, pathologized spaces outside of an otherwise healthy urban "foodscape." By presenting individuals living in these neighborhoods mainly with inexpensive, nutritionally poor food options (it is argued), food deserts contribute to rising levels of obesity in low-income neighborhoods. The social ecological emphasis on individuals as adaptive organisms is evident here in analytical models that treat neighborhood residents as passive and immobile, with food consumption habits determined largely by their nominal place of residence, a site that itself may change often for low-income households lacking financial security.

As Cummins et al. (2007) have noted, this approach also neglects a consideration of food deserts as relational sites comprised by the daily mobility of residents and their migration history, affective attachments between individuals and particular foods and food sources (based on life history, cultural preference, or class status), and broader patterns of economic and racial segregation across metropolitan areas. While work on food deserts in the United States has mainly been done by epidemiologists, geographers have played a more significant role in the U.K. and Canada, placing low-access neighborhoods within the context of retail economic restructuring or providing

longitudinal analyses of changes in supermarket access (I. Clarke et al., 2004; Cummins, 2005; Donald, 2013; Larsen & Gilliland, 2008; Wrigley, Guy, & Lowe, 2002). The more nuanced conceptualization of the relationship between various actors and their neighborhood context shown in these pieces, while more the exception than the rule, demonstrates the potential breadth and geographical richness of this line of research when done in a more interdisciplinary manner.

Still, the reliance on strict measures of distance in most food desert research naturalizes food deserts, treating them as anomalies in an otherwise functional food system. In the United States specifically, most work on food deserts concentrates on methods by which to locate them, measure their effects, or assess proposed solutions, such as the opening of new supermarkets. Only a handful of projects study *how* food deserts emerge over time (Black, Carpiano, Fleming, & Lauster, 2011; Larsen & Gilliland, 2008; McClintock, 2011). As a result, these projects focus primarily on creating environments that promote healthy choices and less on the political and economic decisions which shaped these environments to begin with.

5 Food deserts: disciplining poor bodies

Reflecting a confluence of social ecological approaches to public health, action to reduce obesity rates, and advances in GIS technology, initiatives to study and address food deserts are at the forefront of initiatives addressing place effects on health (Riva, Gauvin, & Barnett, 2007; Roux, 2001). The use of this work to create a new and healthier

urban food landscape operates as a spatialized form of "neoliberal paternalism." As described by Soss, Fording, and Schram in their book *Disciplining the Poor*, neoliberal paternalism asserts as a founding assumption that "the poor lack the competence to manage their own affairs," (2011, p. 25), reflecting a view of social dysfunction as the product of what Wendy Brown terms the "mismanaged life" (W. Brown, 2005, p. 42) To remedy this, neoliberal paternalism revises the Keynesian welfare state in order to restore social order to low-income communities. The 1996 welfare reform legislation in the United States, for example, sought to end what critics saw as dependency on government largesse by tying benefits to work requirements and setting lifetime limits on the amount of benefits individuals could receive. The goal of such policies is not simply to encourage more constructive social behavior, but "to change a person's basic values and self-conceptions, reconstructing the citizen as a different kind of self-regulating subject" (Soss et al., 2011, p. 26). The ideal neoliberal subject valued through these projects is first and foremost "a consumer, worker, and taxpaying customer of the state" (p. 22).

The "neoliberal" in neoliberal paternalism is most evident in the casting of individuals as calculative consumers, capable of a self-regulative morality that is largely cast in market terms. In Brown's description, "neoliberalism equates moral responsibility with rational action; it erases the division between economic and moral behavior by configuring morality entirely as a matter of rational deliberation about costs, benefits, and consequences" (W. Brown, 2005, p. 42). In other words, within neoliberalism, the moral citizen is one optimizes their health and productivity through deliberate, rational self-

management. Although *Disciplining the Poor* primarily focuses on policy and practice in welfare programs, food desert policies demonstrate a similar concern with increasing individuals' capacity to rationally govern their own appetites and bodies. In this way, they can be read as an expanded, spatialized form of governance that builds upon the system of sanctions and incentives described by Soss, Fording and Schram, one that reforms the poor choices made by low-income populations. Interventions to address obesity specifically advocate policies which "nudge" individuals to make healthier choices. This focus on choice highlights how individuals are primarily treated as consumers in this approach, not as citizens who may demand better working conditions, greater or different forms of food assistance, or alternatives to industrialized food production systems.

However, a tension exists between this emphasis on consumer choice and the social ecological insistence that individuals ultimately are adaptive to their environment, necessitating the paternalism of the state and health experts. This is perhaps most clearly evident in the related push for "libertarian paternalism" or, as it is often more simply known, the "nudge" (Ariely, 2010; R. Jones, Pykett, & Whitehead, 2010; Thaler & Sunstein, 2003). Richard Thaler and Cass Sunstein, the two most vocal advocates of this view, cite work in behavioral economics to argue against the assumption of the pure rational actor in economic theory (Kahneman & Tversky, 1979; Simon, 1955). In their view, individual choices are always responsive to context and contain "systemic blunders" tied to the heuristic schemes and information processing hard-wired into the brain (Thaler & Sunstein, 2003, p. 176). Rather than continue a pointless pursuit of

rational choice models, advocates of libertarian paternalism argue instead that "choice architects" should embrace their role in shaping individual choices and seek to nudge individuals in directions that lead to both their own benefit and that of society as a whole (Thaler & Sunstein, 2008a, 2008b). A common example is the decision to make enrollment in a retirement plan the default choice rather than an opt-in for employees, resulting in a more financially secure old age that is in turn less burdensome for society as a whole. This approach preserves individuals' freedom to choose, and is hence "libertarian," but also paternalistically stacks the deck to encourage certain choices over others.

In her appraisal of nudge policies in the UK, Pykett (2011) notes how they neglect "embodied subjectivity" (p. 229). A focus on the brain's neural pathways alone, she argues, can homogenize populations and minimize the importance of "deeply ingrained social norms, expectations and aspirations pertaining to the specific historical and discursive experiences of both men and women alike" (p. 230). The "universal, irrational subject" (p. 233) posited by libertarian paternalist approaches is ungendered (and also unraced, unclassed, and unaged), lacking any kind of social history or affective attachments. Neurology can also help explain the relationship between cognition and embodiment (Gibbs, 2006), but in practice, research on environmental influences has largely assumed a uniform effect on residential populations. As a result, public health experts can rationalize the food environment through analysis of key metrics. In the case of food deserts, interventions are designed through the work of what we might call *choice*

landscape architects[6] who create the environments that frame everyday food consumption decisions. In this sense, the spatial politics of food deserts are an expansion of the neoliberal paternalism identified by Soss, Fording, and Schram, producing urban landscapes that result in moral behavior.

The Foucaultian insistence that individual choices are unavoidably situated within fields of power is highly relevant here. That is, the choice between a fried chicken and fruit salad is never simply a matter of nutrition. Rather, reforming food consumption is about socialization into foodways that are inextricably tied up in social positions defined through race, class, and gender. As Soss, Schram and Fording argue, low-income populations under neoliberal paternalism are seen as "undisciplined and irresponsible; their work ethic is underdeveloped; their sexuality is unrestrained; and, as a result, their communities are plagued by disorder and pathology" (Soss et al., 2011, p. 81). They note the connection between these perceptions of poverty and racial stereotypes. This point could be extended to the obesity debate, which focuses on undisciplined eaters similarly typified by stigmatized class and race identities.

However, rather than the disciplining system of welfare program penalties detailed in *Disciplining the Poor,* initiatives to solve food deserts act only indirectly upon the individual. These projects thus aim to produce new kinds of citizens through their neighborhood spaces, slim-bodied consumers whose rational, nutritious food shopping demands little of the state. In this sense, policies designed to ameliorate food deserts

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[6] Thanks to Joe Soss for suggesting this phrasing.

enhance individuals' ability to make good choices, overcoming the limitations of a body that "has excellent physiological defenses against the depletion of body energy stores, [but] has weak defenses against the accumulation of excess energy stores when food is abundant" (J O Hill and Peters, 1998, p. 1371). Each person's ability to choose, to be a consumer, is both a fundamental right and fundamentally flawed, requiring the actions of the state and private actors to reach its fullest potential. In this sense, Thaler and Sunstein's contradictory framing of "libertarian paternalism" is simply an extension of a deeper contradiction within neoliberalism itself, one which treats the market as both natural and constructed, liberated from state control but also fashioned by it. While this paper lacks the space to consider how food deserts may represent a broader shift in urban poverty governance toward such environmental approaches, the popularity of the "nudge" certainly suggests the possibility of such a shift.

In addition, locating the source of obesity within specific neighborhoods both pathologizes these spaces and potentially excludes a more systemic critique of both the conventional food system and urban development patterns. Certainly, there is value in highlighting the lack of resources and amenities in low income neighborhoods. Yet geographic studies of food deserts often define these areas through their absences, particularly the lack of major supermarkets. As a result, the problem of food deserts is a neatly bounded one, solved by creating new food retail where none currently exists. A more sophisticated conceptualization of spaces as fundamentally relational in nature calls this approach into question (Cummins et al., 2007; Massey, 2005). Supermarkets

flourished in the suburbs, for example, precisely because of white flight in the 1960s and 1970s and zoning policies that encouraged suburban sprawl. Normalizing them as a model of a healthy food system implicitly sanctions the policies and processes that led to their creation. In addition, incentivizing new supermarkets implies that these stores provide a net social and environmental benefit, a questionable assertion given the reliance on low wages and input intensive agricultural practices in conventional food production. The identification of certain neighborhoods as food deserts may thus identify the symptoms of a dysfunctional food system and patterns of economic and racial segregation, but do little to shed light on the more geographically expansive processes that cause them. The result is to *place* the blame (in multiple senses of the term) in poor neighborhoods, rather than in policies and actors which shape both urban development and food systems.

Emerging work in the area of food justice contests this framing of low food access (Alkon & Agyeman, 2011; Gottlieb & Joshi, 2010). Primarily based in the U.S. and explicitly building off environmental justice work, food justice considers how efforts to create an alternative, more sustainable food system intersect with broader efforts to empower communities of color. Recognizing that "race and class play a central role in organizing the production, distribution, and consumption of food" (Alkon and Agyeman, 2011, p. 4), food justice efforts focus around projects that improve the food sovereignty of low-income communities through initiatives ranging from urban agriculture to improving working conditions for farm workers (Bybee, 2009; Common Dreams staff,

2012). The saliency of race in discussions of food access and poverty in the U.S. may be responsible for the vibrancy of this movement there, though it is certainly not limited to that national context (Food and Fairness Inquiry, 2010; Haddad, Chandrasekhar, & Swain, 2012). This more systemic perspective resists spatial compartmentalization of food access as a problem, advocating instead for communities of color to have a greater voice in all areas of the food system. Rather than simply bringing "good food to others" (Guthman, 2008), these efforts ground alternative food efforts within the traditions of the communities they serve.

As Guthman has argued, solutions to food deserts too often involve redesigning low-income communities to be more like middle-class neighborhoods through the creation of new retail and neighborhood amenities, primarily new grocery stores but also "foodie" destinations such as community gardens, farmers' markets, and food cooperatives (Guthman, 2011). Funding to improve food access flows not to community members themselves but in most cases to retailers, who become purveyors of food assistance through their low-priced goods and their provision of jobs for the community. As a result, it is private industry who becomes the agent of revitalization. By governing through neighborhood space, the majority of these projects seek to encourage thin bodies, but also the spaces of middle-class urbanity, in which problematic bodies marked by weight, and to a significant extent race and class, no longer exist.

6 Alternatives: embodied subjectivities, mapping subjects, and political ecology

By examining the rise of social ecology as a primary model of how individuals relate to their environments and its application to the "problem" of obesity, this paper argues that work on food deserts does little to lessen the stigma on low-income communities and their residents. Because it presents poor food access as a spatially bounded phenomenon, research on food deserts normalizes the "foodscape" of middle-class neighborhoods and thus makes a more systemic evaluation of the conventional food system more difficult. Drawing on a model that emphasizes individuals' adaptivity to their environment, work in social ecology treats individuals as "universally irrational," necessitating the intervention of choice landscape architects who can shape environments to promote optimal choices. Initiatives to improve the "food environment" thus represent a spatialized form of neoliberal governance aimed at producing slim consumers less burdensome to the state.

Despite its political currency, the future of research on food deserts and neighborhood influences on health more generally remains open. A front page New York Times story in April 2012 cited two longitudinal studies questioning the connection between neighborhood food environments, food consumption, and rates of obesity (Kolata, 2012, see also An & Sturm, 2012; H. Lee, 2012). Similarly, a much publicized review of food desert literature found no clear link between supermarket access and BMI (Boone-Heinonen et al., 2011). The widespread interest in these findings demonstrates

both the popular appeal of food deserts as a concept and the possibility for crafting alternative definitions of low-access areas that avoid the problems outlined in this paper.

One path forward may entail recognizing the multiple ways individuals value and interact with their food environment, rather than elevating a single optimized rationality defined primarily through nutrition and cost. Rather than designing interventions meant to rationalize supposedly irrational food behaviors, greater attention to how these embodied differences matter in individuals' practical provisioning habits may help fashion a more nuanced and less stigmatizing portrait of low-income neighborhoods. These could emphasize the multiple normative frameworks that shape these practices, such as how family relationships, concerns over class status, or cultural norms influence food procurement.[7] Opening up the definition of health itself beyond the measurement of BMI is also an important step. Work in this area may also involve picking up on an early thread of attention to the food procurement habits and values of individuals in low-income areas that has been markedly less emulated than GIS-based geographic studies (for exceptions, see Y. Park et al., 2011; Shaw, 2006; Whelan et al., 2002). Such an approach may forefront more structural concerns, including access to transit or the effects of racial and/or economic segregation on overall mobility (Ledoux & Vojnovic, 2012).

Indeed, breaking down the divide from social ecology between analyst and organism can draw from work under the broad umbrella of critical GIS (Sheppard, 2005).

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[7] Barnett, et al. (2008) make a similar point in their extension of Sayer's concept of "lay normativity." They argue that the individuals constantly engage in everyday reasoning that represents a continued refashioning of the self as a moral agent—"ongoing elaborations of the self" (p. 649).

This work concentrates particularly on increasing the visibility of informal or affective dimensions of social life, such as feelings of safety while travelling through urban space (Mei-po Kwan, 2008) or the household economies of post-Soviet Russia (M. Pavlovskaya, 2004). Similar recent work on mobilities has stressed the importance of understanding the body's relationship to the city, mapping its movements and connectivities (Conradson & Latham, 2005; Cresswell, 2006). By questioning the widespread "god's eye" view of GIS, work on participatory GIS has stressed community involvement in the research process, shifting research subjects from a "missing object to a mapping subject" (Pavlovskaya & Martin, 2007; see also Elwood, 2006b), a phrase that resonates with the critique of food desert work outlined in this paper. Rogalsky's (2010) use of GIS to map the daily mobility of working poor women, for example, highlights how aggregated data on transportation options in low income communities present a "too-optimistic" picture of the transition from welfare to work. Approaches such as these, especially those which incorporate research subjects as co-investigators, would heed the call from food justice researchers and activists to more explicitly include the concerns and voices of marginalized populations in food systems work.

Lastly, while political ecology shares the emphasis on human-environment relations also common in social ecology, the former has more thoroughly included work interrogating the production of urban environments (Heynen, 2006; Keil, 2007; Robbins, 2004; Swyngedouw & Heynen, 2003; Walker, 2007). Political ecology's framing of "place not as a location or portion of geographical space, but as being constructed and

reconstructed out of a particular set of social relations, experiences, and understandings" might provide a basis for other kinds of geographic analyses (B. King, 2009, p. 42). Taking a broad view to understand the political ecology of food consumption—how varying food sources come to be located in particular sections of the city—might question the naturalizing language of market relations that positions low-income neighborhoods as just another emerging market. Instead, such an approach would highlight how patterns of food access are determined through the action of state and market actors in the zoning or evaluation of potential store sites, regulations around agricultural use of urban land or direct sales by growers, or the routing of public transit networks. The large body of work on commodity chains is another resource, potentially highlighting the systems of production that bring goods into urban neighborhoods (Cook, 2004; Hartwick, 1998; Jackson, Ward, & Russell, 2006). This approach would frame food deserts as produced by (and symptomatic of) the broader workings of a capitalistic, highly centralized food system, rather than simply aberrations in an otherwise functional market economy.

Food deserts are emblematic of new, geographically aware public health approaches aimed at creating healthier, more livable cities. In current practice, most research in this area continues to pathologize both neighborhoods and their residents, positioning them as hapless victims in need of paternalist intervention. By better situating these neighborhoods within their geographic context and opening up strict definitions of healthy neighborhoods and bodies, better alternatives for understanding the relations

between neighborhoods and their residents may be developed. As Jones et al. (2010) recognize, the incorporation of the environment as an actor in everyday behavior need not necessarily entail experts who "deploy novel, even manipulative, psychological techniques in their spatial machinations[….]It is possible to see how it could be a tool of place-building, where acts of community consultation and engagement co-constitute techniques associated with libertarian paternalism to form inclusive and creative places of deliberative psychological action" (p. 497).

Chapter 3

Mobility and mid-sized grocers: what SNAP data show about food access in low-income urban neighborhoods

1 Introduction

Over the last decade, an increasing amount of research and policy attention has been given to food deserts, communities lacking access to food that is affordable, nutritious, and of good quality. Food deserts as a concept originated in the United Kingdom, but have spread throughout the Anglophone world as a way of framing poor food access (Beaulac et al., 2009; Wrigley, 2002). Without access to affordable, healthy foods, residents of food deserts are left only with fast food restaurants and corner stores as local food shopping options. The nutritionally poor foods at these locations result in an increased risk for obesity and its associated health conditions. Currently, the majority of studies focusing on food deserts use a spatial analytical approach, measuring the distance to, and density of, various food retail sites—supermarkets and fast food stores, for example—based on individuals' place of residence. This data is then correlated with measures of social deprivation to identify areas most at risk from poor food access and its related health consequences: obesity and diet related diseases. This approach is conceptually straight-forward, accessible to any organization with GIS software, and a clear metric for both identifying food deserts and assessing the effects of proposed interventions.

However, as a front page story in the New York Times recently noted, several studies have questioned the association between geographic access to food and health outcomes, noting that residence in a food desert may not increase the risk of diet related health problems (Boone-Heinonen et al., 2011; Kolata, 2012; H. Lee, 2012). This lack of correspondence may be partially due to three key assumptions made in much current work on food deserts. First, supermarkets and large grocers are often treated as unequivocal proxies for healthy foods, as these stores are assumed to have abundant, high quality, and low-priced fruits, vegetables, and meats. Second, research often uses distance and density of food stores as the measure through which food access is calculated. Lastly, exposure to neighborhood stores is calculated only from individuals' place of residence, not other significant sites they may visit throughout the day. In making these assumptions, much current research ignores the possibly broad array of food options available in low-income neighborhoods, the mobility of their residents, and these residents' ability and willingness to travel outside their neighborhoods for food sources they find acceptable, all of which may play significant roles in how food access is defined and measured.

Rather than focusing only on the supply of food proximal to residents, this research analyzes spatial patterns of food shopping in low income neighborhoods. In doing so, it questions the prominent role given to Euclidean distance in shaping food shopping decisions and demonstrates how residents draw upon a range of food retailers to make do on limited budgets. Using monthly benefit distribution and redemption data from the

Supplemental Nutrition Assistance Program (SNAP, formerly known as food stamps), this paper shows that that low-income individuals can and often do travel outside their immediate neighborhoods to get food, problematizing analyses based only on place of residence. While the dominant role of supermarkets and supercenters in the food retail sector is well known, SNAP data also highlight the significant role played by mid-sized grocers in the food shopping practices of low-income urban households. Indeed, SNAP data provides a rich and underused resource for understanding these trends, and future research using this data might strengthen understanding of how patterns of food access are affected by urban form and demographic change.

2 Food deserts, SNAP, and the influence of the food environment

2.1 Food deserts and measuring access to healthy foods

Research on food deserts has blossomed over the past decade. The term generally describes communities where healthy foods—particularly fresh fruits and vegetables—are either absent, comparatively expensive, or of poor quality. Its roots lie within a public health perspective that does not focus on individuals but rather on ecologies of health promoting environments (Egger & Swinburn, 1997; Stokols, 1992, 1995). Work on food deserts explores the influence of neighborhoods on dietary behavior, similar to a broader body of work on obesogenic environments (Nelson & Woods, 2009; Townshend & Lake, 2009). Rather than prioritizing nutritional education for individuals, this work suggests that alterations in neighborhood food options may result in improved dietary habits,

reduced rates of obesity, and improvements in associated health outcomes. As mentioned above, food desert research originated in the United Kingdom, where government sponsored research brought it to prominence in the early 2000s (Wrigley, 2002). Subsequent research quickly spread to the U.S. and Canada (Apparicio et al., 2007; Fuzhong Li et al., 2009; Larsen & Gilliland, 2008; Zenk, Schulz, & Israel, 2005). Most of this work has been focused on urban neighborhoods, though there is a smaller body of work investigating food deserts in rural areas (Gross & Rosenberger, 2010; Hubley, 2010; McEntee & Agyeman, 2010).

Methodologically, work on food deserts has fallen into two main approaches. *Market basket studies* survey store offerings in one or more geographic areas in order to document differences in the selection, price, and/or quality of healthy foods linked to broader patterns of economic or racial segregation. Block and Kouba (2007), for example, compared prices in two Chicago communities, one urban and one in the near suburbs. They found that while prices varied, supermarkets provided the best access to affordable, high quality produce and these were more common in the suburban community. Bodor et al. (2007) measured both the food consumption of neighborhood residents and shelf space given to produce in small stores in four New Orleans census tracts, finding a link between the availability of fresh vegetables and their consumption by nearby residents. Hendrickson, Smith and Eikenberry's (2006) survey of both urban and rural Minnesota communities found that prices in these areas were higher than the market basket price provided by the USDA's thrifty food plan, pointing to the expense of

purchasing food, particularly in rural areas. Market basket research provides a nuanced picture of food options in low-income areas. However, the cost and complexity of these studies necessarily limits their geographic and temporal extent.

In part because of this limitation, most recent food desert research has taken a *spatial analytical* approach to studying food access. These approaches utilize geographic information systems (GIS) to analyze the distance to and density of healthy food retailers across a variety of neighborhoods. These results are then combined with demographic measures of social deprivation to identify vulnerable populations at risk from poor food access. Zenk et al. (2005) were one of the first to use this approach, measuring the distance to the nearest supermarket from the center point (centroid) of Detroit neighborhoods and concluding that many African-American neighborhoods had poor food access. Later studies have combined several measures and used more refined analytical techniques. Larsen and Gilliland (2008) used data on supermarket locations from London, Ontario in 1961 and 2005 to create four different accessibility measures for each time period using network distances, which take into account existing street and transit networks. The results of their analysis showed that supermarket access in the core of the city has lessened over time. In contrast, Apparicio et al. (2007) studied current supermarket access in Montreal using three different accessibility measures, measuring distance to the nearest supermarket, number of supermarkets within a 1 km buffer, and average distance to the three closest supermarket chains. Their research found little evidence of food deserts within Montreal. This inconsistency has been common in

research done outside the United States, the one country where food deserts have reliably been identified using this approach (USDA Economic Research Service, 2009). When available, statistics on weight and body mass index (BMI) have been also been used to analyze the relationship between store accessibility (their "food environment") and obesity rates (Inagami et al., 2009; Raja et al., 2010).

Several well-publicized recent studies have questioned the association of store locations with rates of obesity. Lee (2012) drew upon a longitudinal health survey of elementary school students, combining it with measures of their food environment to find "that differential exposure to food environments bears little relationship to[…]childhood obesity development" (p. 1202). An and Sturm (2012) reported a similar result from their analysis of a cross-sectional survey of elementary students and their food environment. These studies suggest that individuals' shopping and food consumption practices cannot be easily captured by relatively straightforward geographic analyses using distance-based measures. Indeed, the few studies done on the distance travelled to obtain food among low-income populations confirm that the closest store is seldom the one most visited (Hillier et al., 2011; USDA Economic Research Service, 2009, p. 63). A related line of inquiry has investigated other factors shaping food procurement in low-income neighborhoods, finding that budget constraints, personal mobility, class based store associations and differing definitions of healthy foods all play a significant role (Coveney & O'Dwyer, 2009; Park et al., 2011; H. J. Shaw, 2006b; Whelan et al., 2002). Most studies have relied on survey data to describe general

shopping habits among a given population, without reference to specific neighborhood contexts. However, some recent research has tracked the relationship between daily mobility and food procurement. One Detroit based study used personal GPS devices to follow 120 study participants daily mobility over the course of seven days, combining these data with self-reported dietary behavior. In this research, fast food exposure within individual activity spaces (defined through their daily mobility) was associated with increased consumption of both saturated fat and decreased consumption of whole grains (Zenk et al., 2011). Another study of 258 households, also based in Detroit, used shopping surveys to demonstrate that low-income residents regularly shopped for food outside of their neighborhoods, even when they lacked access to their own vehicle (Ledoux & Vojnovic, 2012). Related research on the mobility of welfare recipients has also found that far from being trapped in their neighborhoods, low-income individuals regularly travel outside their residential area by relying on rides from friends and family and public transportation (Rogalsky, 2010b).

This research shows that geography matters in shaping the food procurement practices of urban populations, but that this may include more than just the residential neighborhood. Rather, neighborhood effects may depend on a variety of factors including transit systems, household composition, classed and cultural norms, and individual mobility. Initial research on the mobility of low-income populations shows that food shopping is often done outside the residential neighborhood. However, the work done by Zenk et al. and Ledoux & Vojnovic have included a few hundred participants and have

thus been somewhat limited in scope. This study builds upon previous research by drawing on broad scale food consumption data for a large metropolitan area, using data from over 260,000 SNAP recipients and 1,300 store locations to study patterns of benefit usage, particularly the extent to which SNAP benefits are used in clients' residential neighborhoods. In this way, this research provides an alternative way of both conceiving of and measuring the food access landscape of urban neighborhoods, one that incorporates the everyday mobility and food practices of low income populations.

2.2 SNAP, obesity, and healthy food consumption

The federal food stamp program has a complex history, but its origins date to the late 1930s as part of the New Deal (Landers, 2007; Moran, 2011). This initial program augmented the food budgets of qualifying households, allowing them to purchase stamp booklets good for buying foods at participating private stores (Deutsch, 2010; Moran, 2011). This initial program ended during World War II, but was revived and given permanent status during the 1960s. Food stamp recipients no longer have to purchase stamps, but the economic significance of the program is clear from data on its usage. As of 2011, the program provided almost $72 billion in benefits per year to just over 44 million recipients (USDA, 2012a). This figure reflects an expansion in the program since 2009, when increases to SNAP benefits were included as part of the economic stimulus package. Currently, a household must have a gross income at or below 130% of the federal poverty level to qualify for SNAP benefits. In 2008, the U.S. Department of

Agriculture (USDA), which administers the program, estimated that 67% of eligible individuals were receiving SNAP (Leftin, 2008).

The size of this program and its role as an anti-poverty measure has resulted in heated political arguments. These have included debates over the proper size of SNAP benefits (O'Keefe, 2012), initiatives to restrict usage of SNAP benefits for unhealthy foods (Associated Press, 2010), and programs to incentivize purchases of healthy and/or sustainably produced foods (Briggs, Fisher, Lott, Miller, & Tessman, 2010; Guthrie, Lin, Ver Ploeg, & Frazao, 2007). These policy debates are complicated in part by the tendency of most research SNAP to be national in scale and focus predominantly on participation rates and health outcomes. Johnson (2011), for instance, examined the reasons for growth in SNAP participation during the economic recovery of the mid 2000s using panel survey data, finding a decreased rate of exit from the program to be the main factor. Leftin (2008), in a report written for the USDA, similarly examined rates of participation in SNAP, finding that elderly populations and those with no cash income were among those with the lowest enrollment in the program. Other research, also sponsored by the USDA, has focused on the relationship of program participation to both household food security and health outcomes. For example, one USDA study found that increases in SNAP benefits following the 2009 federal stimulus bill resulted in higher food expenditures and lower food insecurity for SNAP households (Nord & Prell, 2011). Another publication noted the mixed effects on diet quality seen as a result of SNAP participation, with foods like whole milk and regular soda more likely to be consumed by

SNAP clients (USDA, 2012b). In a review of research on SNAP's effect on obesity, Debono et al. (2012) found a modest but significant relationship for women specifically, meaning that program participation was associated with an *increased* chance of obesity, though the causal pathway for this connection was unclear.

Relatively little research has focused on the geographic patterns present in SNAP benefit usage. The USDA does not release data on SNAP redemptions at the store level or its classification of particular stores, all of which complicate efforts to understand exactly how SNAP benefits are used and how food retailers and producers benefit from the program. Ohls et al. (1999) relied on a national survey of SNAP eligible populations to better understand usage patterns, finding in part that SNAP participants were more likely to be dissatisfied with the food options in their neighborhood and also more likely to travel out of their neighborhoods to shop for food. Andrews et al. (2012) conducted a national county level study of how an increase in SNAP benefits in 2009 affected participants' usage of large retailers in food deserts, finding that the increase in benefits was associated with a small but significant increase in use of these superstores. Neighborhood level on SNAP participation and usage would greatly enrich research into patterns of food access among low-income neighborhoods, especially given the large size of the program and the decade or more of electronic records held by the USDA. By creating small area estimates based on currently available data, this research study highlights the potential value of data on SNAP in analyzing patterns of food access within low income communities. The result is data that, narrowly defined, provides more

information on the spatial patterns of SNAP utilization at a fine scale. Analysis of these data thus contributes to ongoing debates about the impact of SNAP benefits in low-income communities. More broadly, these data provide more information on how SNAP receiving populations navigate their neighborhood food landscape, providing a rarely used perspective on the food procurement practices in low-income communities.

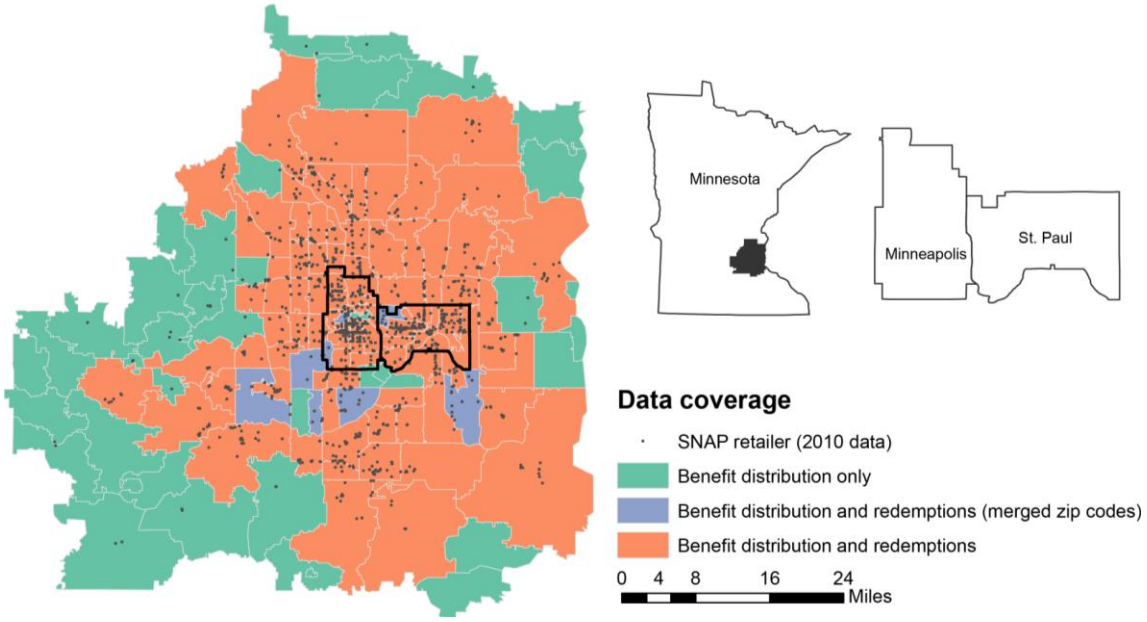


Figure 3.1: Study area zip codes and available data

3 Data and Methods

3.1 Setting and data

This research uses data on SNAP benefit distribution from the seven county metropolitan area surrounding Minneapolis and St. Paul, Minnesota (see figure 1). In 2010, the Twin Cities metropolitan area had population of 2.9 million people (United States Census Bureau, 2013). This study used data on SNAP benefit redemptions for

fiscal year 2010, which ran from October 2009 through September 2010. During this time, the number of individuals receiving SNAP benefits increased 12%, from roughly 250,000 to 275,000, and the amount of benefits disbursed to individuals each month also increased 11%, from approximately $27 million to $29.9 million.

SNAP is a complex program, administered by both federal and state governments. The U.S. Department of Agriculture (USDA) enrolls food vendors and supervises the reimbursement of benefits they receive. In Minnesota, the state's Department of Human Services (DHS) handles client enrollment and benefit disbursement. As a result, data on SNAP benefits are housed in two separate systems. The Minnesota DHS provided data on the location of SNAP clients and the benefits they received during the study period, and the USDA provided data on vendor locations and the locations where benefits were redeemed. At this time, these two datasets cannot be linked, meaning that it is impossible to directly trace how clients in a particular neighborhood use their benefits. However, it is possible to compare the distribution of benefits to clients to the use of benefits at stores within a given area, which is the approach used in this research.

The finest scale at which both the USDA and the Minnesota DHS offer data is for zip codes. The DHS was able to provide data for all zip codes within the seven county metropolitan area. The USDA requires that at least four stores be present within a given zip code in order to release data, so as to protect the exact redemption levels at each store. Most of the core areas of the Twin Cities met this criterion, and the USDA also allowed zip codes to be combined in order to release additional data. The resulting dataset,

mapped out in figure 1, includes the vast majority of the metropolitan population. Based on 2010 Census data, of the 2.8 million people in the zip codes covered in data on SNAP benefit distribution, 2.6 million (93%) lived in zip codes where data on store redemptions was also available. Similarly, of the 275,366 people receiving SNAP benefits in September of 2010, 262,868 (96%) of them lived in zip codes where store redemption data was available.

3.2 Data preparation and analysis

Zip code level data has only limited value for neighborhood level analysis. In urban areas, they cover areas significantly larger than census tracts and have populations in the tens of thousands. The U.S. Census releases only a small selection of data at the zip code level, complicating analyses that incorporate demographic data. Zip code boundaries are arbitrarily drawn, meaning that they do not necessarily match the distribution of underlying population data. Like any set of administrative boundaries, zip codes are also subject to the modifiable areal unit problem (or MAUP), meaning that the scale and extent of their boundaries may significantly influence data analysis (Fotheringham & Wong, 1991; Raper, Rhind, & Shepherd, 1992; Schuurman, Bell, Dunn, & Oliver, 2007).

Given these issues, this study disaggregated the zip code level data to a finer scale, using a technique known as dasymetric mapping. This approach both improves the spatial resolution of a dataset and creates spatial boundaries that more accurately reflect

data distribution (Crampton, 2004; Eicher & Brewer, 2001; J. K. Wright, 1936). While multiple approaches have been used for this technique (Langford, 2007; Tapp, 2010), this research adapted a commonly used method known as the three-class method (Mennis, 2003). In this approach, data at one scale are disaggregated to a smaller scale based on two main weighting variables: (1) the proportion of the total area of the larger unit taken up by the smaller one and (2) the value for a weighting variable found in the smaller unit. While dasymetric mapping is a relatively common technique in population geography, to my knowledge no recent research on neighborhood effects has made use of it.

The first step of this process involved disaggregating zip code level data on the location of SNAP clients based on reported use of the program at the census tract level in the 2006-2010 American Community Survey. This was done using ESRI's ArcGIS software (version 10). The area used for disaggregation was first clipped only to residential areas based on existing zoning data. I then disaggregated the zip code data to tract level using two variables: the relative size of each tract (or portion of a tract) within a zip code and the relative proportion of households receiving SNAP benefits in each tract. Each of these variables was normalized relative to the total values contained within a zip code. With regards to the first variable, based on the area of each tract, the "area ratio" was calculated in the following way:

$$\mathrm{ar}_{A1} = \left(\frac{\mathrm{area}_{A1}}{\mathrm{area}_{A}}\right) \Big/ \left(\frac{1}{\#\mathrm{tracts}_{A}}\right)$$

Here, ar_{A1} and $area_{A1}$ refer to the area ratio and area of the intersection between zip code A and census tract 1, $area_A$ refers to the total area of zip code A, and $\#tracts_A$ refers to the number of tracts intersecting zip code A. The area ratio represents the degree to which a given tract exceeds or is lower than the expected area if all tracts occupied an equal area of the zip code.

In the case of the data on SNAP population, a "population fraction" was created for each tract within a given zip code using data on SNAP household population. This fraction was calculated as follows:

$$pf_{A1} = \frac{den_1}{(den_1 + den_2 + den_3)}$$

Here, pf_{A1} refers to the population fraction for tract A and area 1, den_1 refers to the percent of households within census tract 1 that receive SNAP benefits, and den_2 and den_3 are the percentage of SNAP households in adjoining census tracts 2 and 3. These two variables were combined to a "total fraction" by multiplying them and then normalizing against other tracts within a zip code. I multiplied the total fraction by the SNAP population in the zip code to disaggregate the data to the tract level. A similar process was used to disaggregate this tract level data down to a 30m resolution raster image, using both residential zoning data and remote sensed land use data as weighting variables.

I adapted this process to also disaggregate data on vendor redemptions, though in this case no area weighting was needed since SNAP vendors are point and not area data. Instead, the weighting variable here was reported redemption levels by vendor type for the Twin Cities metropolitan area, data that are publically available from the USDA (table 3.1). Data on SNAP vendors are available by request, and current vendors can be downloaded from USDA's website (http://www.snapretailerlocator.com). USDA does not release its own store categorizations, so I categorized stores manually based on USDA's definitions and a combination of store names, available street view data from Google, and in some cases in person visits. To ease classification, I combined stores with similar definitions and redemption levels into single categories, resulting in eight distinct classifications (table 3.2). While it is impossible to exactly replicate USDA's data, this coding is an approximation that allows for estimated store level redemptions.

Using both total redemptions and the per store average for the metropolitan area, I created weights for each category. Store level redemptions were estimated by distributing the total benefit amounts redeemed within each zip code according to the relative weights of stores within each zip code. The following equation was used to create an estimated redemption level for a given store:

$$storered_1 = totalred_A * \frac{weight_{type1}}{weight_{type1} + weight_{type2} + weight_{type3}}$$

Here, $storered_1$ refers to the estimated SNAP redemptions at store 1, $totalred_A$ refers to the total SNAP store redemptions in zip code A, and $weight_{type\#}$ refers to the weight

given to the store types of stores 1, 2, and 3, which are all the stores in zip code A. The resulting estimated data allow for analysis of benefit at a much finer scale and can be reaggregated up to a variety of areal units, including block groups and census tracts. fuller description of this process is available in a related paper on this project (Shannon & Harvey, 2013).

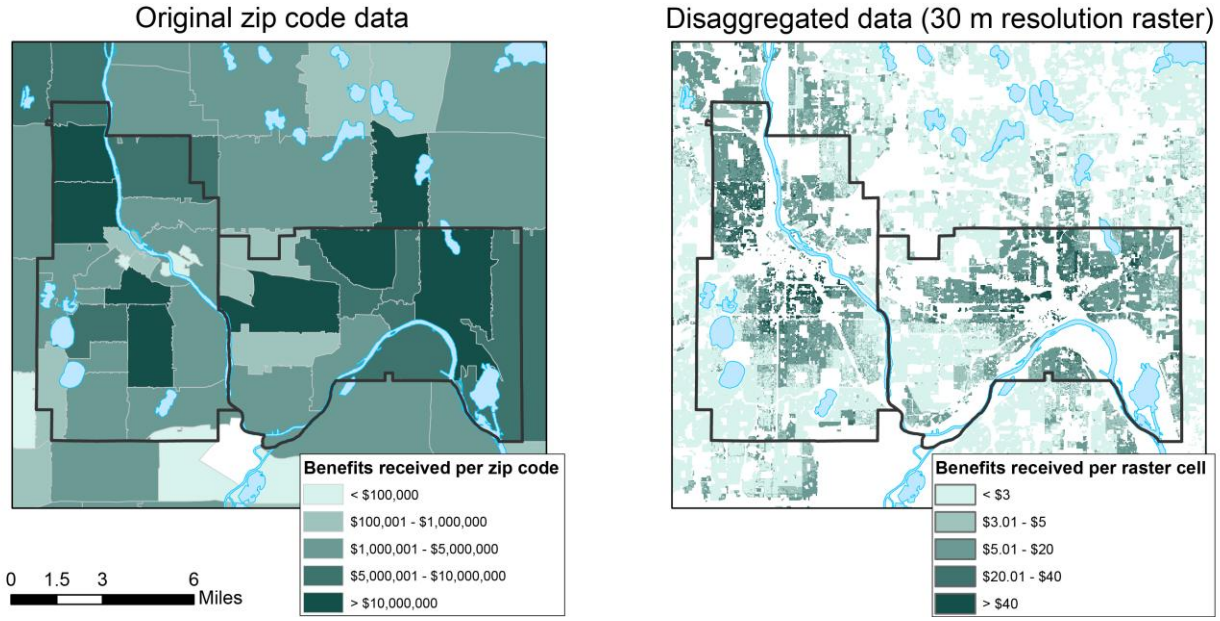


Figure 3.2: Original and disaggregated data on SNAP benefit distribution

To analyze these data and control for possible scale effects, I created square grid cells covering the entire metropolitan area using ArcMap's Fishnet tool (Pontius & Cheuk, 2006; Turner, Costanza, & Sklar, 1989). These grids were created at a variety of spatial scales: 5 km, 2 km, and 500 meters (figures 3.3 and 3.4). SNAP benefit distribution and redemptions were reaggregated to these various units and summed to

find net inflows or outflows of benefit dollars. While the 5 km and 2 km grid cells helped identify broad trends in benefit usage (figure 3.3), the 500 meter cells provided more flexibility in creating analytical areas based on the data distribution (figure 3.4). Neighborhoods were created for analysis at the 500 meter scale by selecting the cells at the top 2% of benefits redeemed (figure 3.4). Cutoffs at 5% and 1% were also considered, but these had little effect on the main shape of these neighborhoods, and the use of a 2% benchmark provided the most clearly defined areas. The results section of this paper details the patterns in benefit utilization and store characteristics of each of these study areas.

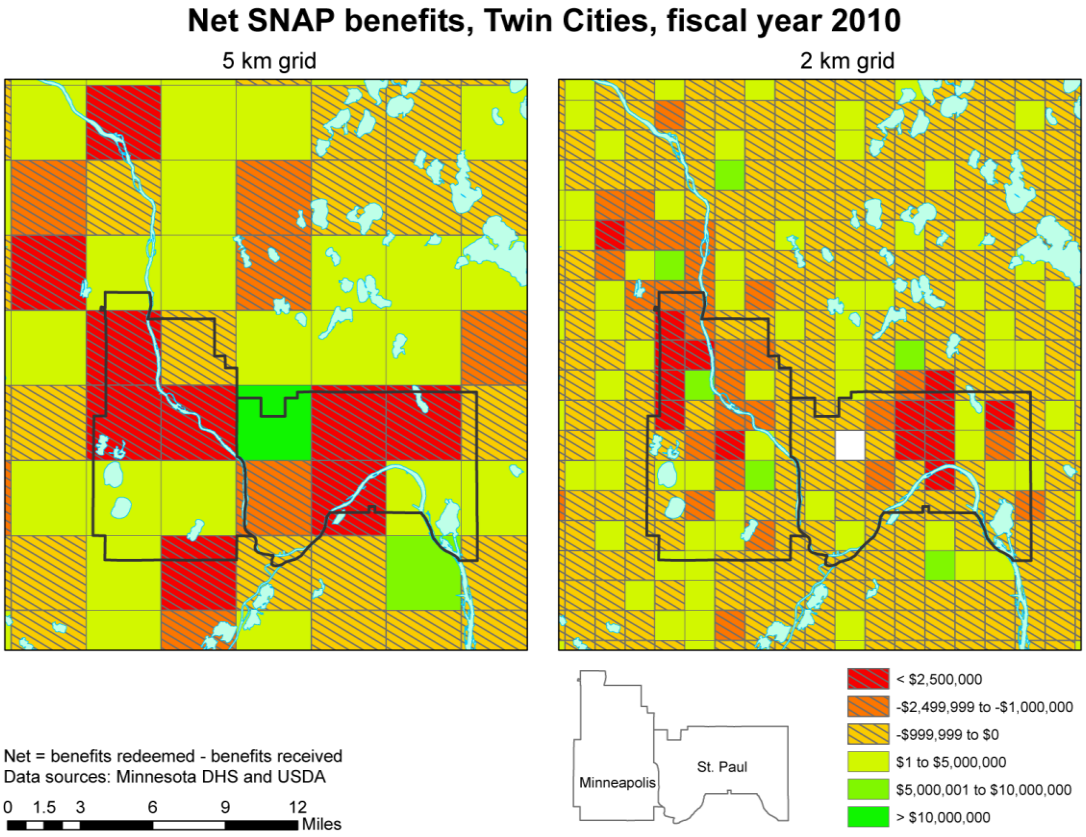


Figure 3.3: Net SNAP benefits, aggregated to 5 km and 2 km grids

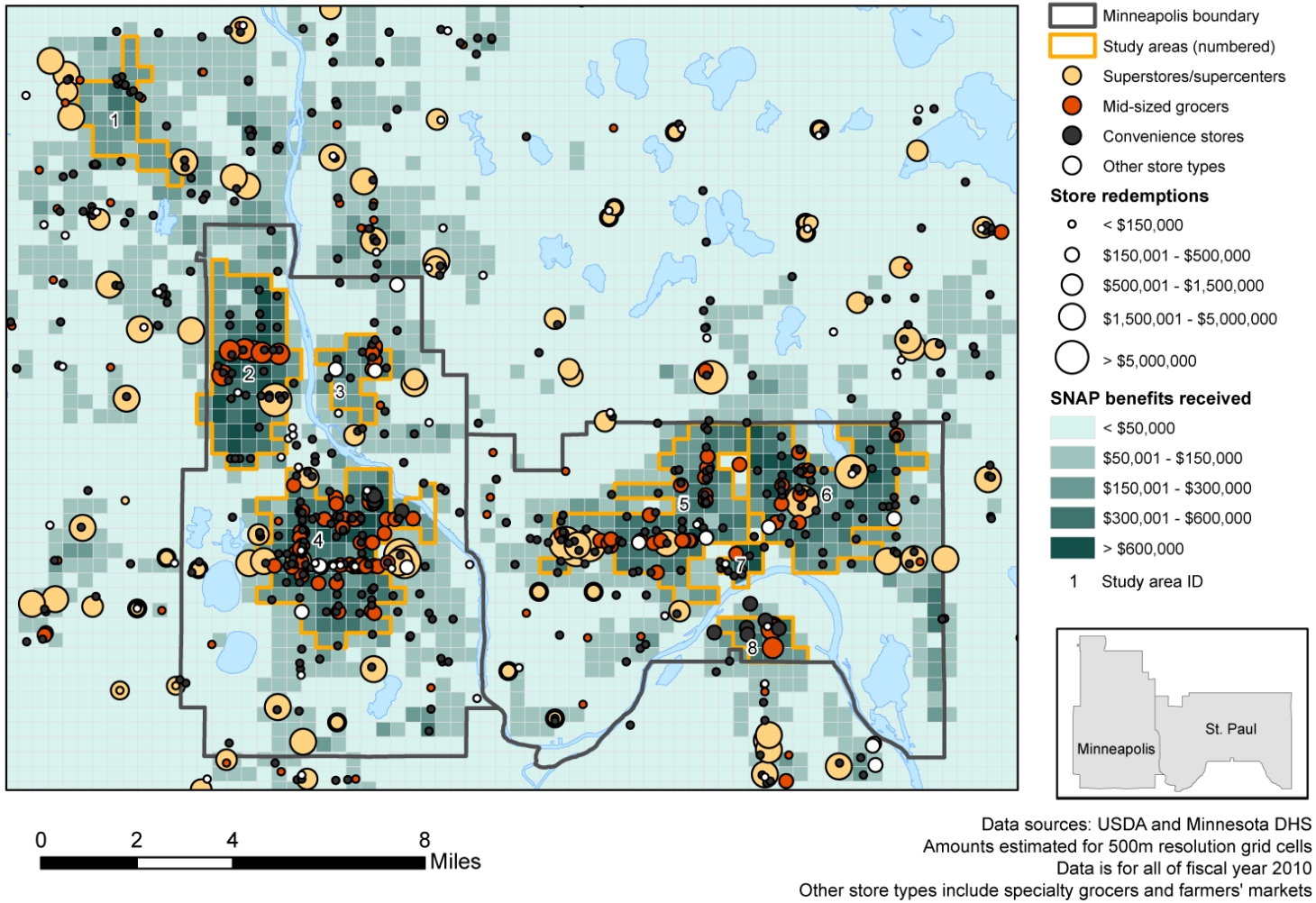


Figure 3.4: Estimates of SNAP benefit distribution and store redemptions, fiscal year 2010

4 Results

4.1 Whole area characteristics and study area demographics

Table 3.1 is the summary of SNAP benefit usage across the entire Twin Cities metropolitan area. Of the 1,363 stores present in the Twin Cities at the end of 2010, over half of those (698) fell into two categories: combination grocery store/other and convenience stores. According to general definitions provided by the USDA, the former category refers to stores that sell food along with non-food items and would include gas stations and dollar stores. Convenience stores offer a limited selection of canned goods and packaged meats. Despite the prevalence of these two store types, they make up a small amount (7%) of total redemptions (table 3.1). Super stores and supercenters, which are combined in the USDA's definitions, together account for 80% of total redemptions, although they only comprise 22% of total vendors. These vendors mostly include big box stores and conventional supermarkets, chains including Wal-mart and Target and well as regional chain supermarkets Cub Foods and Rainbow Foods. The per store average for each of these two categories is also significantly higher than other categories. Super Stores average $1 million per store per year and supermarkets average $519.652. All other grocery categories are at or below $200,000 per year. Clearly, large chains are the primary site at which SNAP benefits are used.

Other smaller stores played a modest role in SNAP redemptions according to these data. The USDA does not clarify the difference between large, medium, and small groceries, but together, these stores averaged $158,210 per store. The Twin Cities has a

particularly active set of food cooperatives, and this is apparent in the per store redemption amounts for these stores, which are comparable to conventional groceries of similar size, $108,214. Farmers' markets received very few benefits in 2010, in large part due to the fact that only three markets accepted SNAP benefits. The per location average, however, was the smallest of any category released by the USDA. Meat and poultry retailers, despite their specialized food offerings, receive about as many benefits each year as food cooperatives or small groceries, averaging over $100,000 per store per year.

Table 3.3 summarizes the population counts and ethnic composition of each of the eight analytical areas used for this study using block level data from the 2010 U.S. Census. Together, these areas contain 12% of the metropolitan area population and are notably less white than the region as a whole. African-American, Asian and Hispanic populations are much higher in these study areas, 19% higher in the case of African-Americans and 8% higher for the other two groups. The population of these study areas are 2% higher for populations under 18 and 4% lower for populations over 65 than the metropolitan area, though this varies widely by specific study area. The four largest areas with regards to both population and land area are found in north and south Minneapolis (areas 2 and 4) and the west and east sections of St. Paul (areas 5 and 6). South Minneapolis has by far the most SNAP retail sites of any of these areas, as well as the largest population (tables 3 and 4). Both south Minneapolis and west St. Paul have access to several large food stores within or near their areas (figure 3.4).

Table 3.1: SNAP vendor redemptions in the Twin Cities metropolitan area, fiscal year 2010

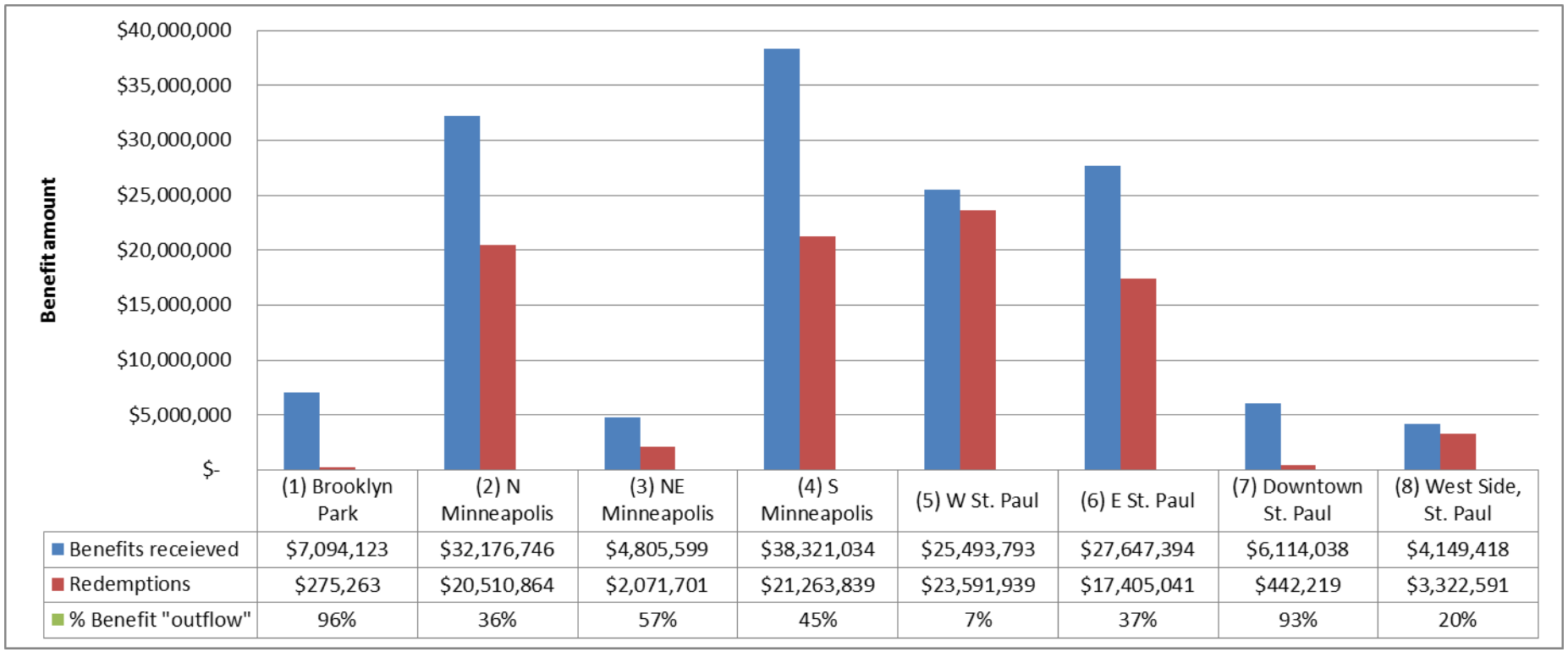
Store Type	**Redeeming Stores**	**Total redemptions**	**% of total redemptions**	**Redemptions per location**
Farmers' Market	3	$4,610*	0%	$1,537
Fruits/Veg Specialty	2	$24,795*	0%	$12,398
Seafood Specialty	4	$29,966	0.01%	$7,492
Delivery Route	11	$682,217	0.20%	$62,020
Non-profit Food Buying Co-op	12	$1,298,562	0.39%	$108,214
Bakery Specialty	67	$1,378,530	0.41%	$20,575
Large Grocery Store	28	$3,619,160	1.09%	$129,256
Meat/Poultry Specialty	47	$5,359,226	1.61%	$114,026
Small Grocery Store	82	$8,688,319	2.61%	$105,955
Combination Grocery/Other	308	$9,055,583	2.72%	$29,401
Convenience Store	390	$13,264,261	3.99%	$34,011
Medium Grocery Store	114	$23,131,448	6.95%	$202,907
Supermarket	66	$34,297,035	10.31%	$519,652
Super Store	229	$231,975,063	69.70%	$1,012,992
Total	1363	$332,808,775		

* Estimated from statewide data

Table 3.2: USDA store counts and study store counts

Code	Category	Study store count	USDA categories	USDA store count
1	Supermarkets and supercenters	181	Super stores	229
2	Reg supercenters and warehouses	54	Supermarkets	66
3	Groceries	216	Large/medium/small groceries and co-ops	236
4	Small grocers/conv. Stores	745	Combo/convenience	698
5	Meat markets	47	Meat market	47
6	Other specialty	110	Fruit/seafood/bakery	73
7	Delivery	12	Delivery	11
8	Sustainable	5	Farmers market/Direct farmer	3
	Total*	1370	Total	1363

* Total includes seven stores present at start of fiscal year 2010 but not included in the year-end total



	(1) Brooklyn Park	(2) N Minneapolis	(3) NE Minneapolis	(4) S Minneapolis	(5) W St. Paul	(6) E St. Paul	(7) Downtown St. Paul	(8) West Side, St. Paul
Benefits receieved	$7,094,123	$32,176,746	$4,805,599	$38,321,034	$25,493,793	$27,647,394	$6,114,038	$4,149,418
Redemptions	$275,263	$20,510,864	$2,071,701	$21,263,839	$23,591,939	$17,405,041	$442,219	$3,322,591
% Benefit "outflow"	96%	36%	57%	45%	7%	37%	93%	20%

Figure 3.5 Patterns in SNAP benefit usage

Table 3.3: SNAP study area demographics

Study Area	Population	% White	% African-American	% Native American	% Asian	% Other	% Two or more races	% Hispanic	% Under 18	% 65 or older
(1) Brooklyn Park	19,006	36%	37%	1%	15%	7%	4%	12%	30%	8%
(2) N Minneapolis	48,633	28%	47%	2%	13%	4%	6%	8%	34%	6%
(3) NE Minneapolis	14,663	64%	17%	3%	2%	8%	6%	15%	20%	9%
(4) S Minneapolis	111,388	52%	24%	3%	5%	11%	5%	19%	19%	7%
(5) W St. Paul	60,504	40%	28%	1%	22%	4%	5%	8%	29%	7%
(6) E St. Paul	61,780	41%	17%	2%	29%	6%	5%	14%	34%	7%
(7) Downtown St. Paul	5,842	74%	15%	1%	5%	1%	3%	4%	7%	13%
(8) West Side, St. Paul	10,210	56%	13%	2%	8%	14%	6%	36%	31%	11%
All study areas	332,026	44%	27%	2%	14%	7%	5%	14%	27%	7%
Metro area	2,849,786	79%	8%	1%	6%	3%	3%	6%	25%	11%

Table 3.4: Store types by case study area

	Store Counts						
	Total	Supermarkets/ supercenters	Midsized grocers	Convenience stores	Other*	Sustainable	Ethnic
Non study areas	981	219	115	513	134	20	90
(1) Brooklyn Park	6	0	1	5	0	0	0
(2) N Minneapolis	39	1	6	31	1	0	6
(3) NE Minneapolis	16	0	6	8	2	1	9
(4) S Minneapolis	128	1	49	69	9	3	56
(5) W St. Paul	69	3	18	44	4	0	29
(6) E St. Paul	54	2	8	41	3	0	17
(7) Downtown St. Paul	11	0	1	9	1	0	1
(8) West Side, St. Paul	8	0	3	4	1	0	5
All study areas	331	7	92	211	21	4	123

Table 3.5 Store redemptions by case study area

		Supermarkets/ supercenters		Midsized grocers		Convenience stores		Other*		Sustainable		Ethnic	
	Total	Benefit amt.	Pct.	Benefit amt.	Pct.	Benefit amt.	Pct.	Benefit amt.	Pct.	Benefit amt.	Pct.	Benefit amt.	Pct.
(1) Brooklyn Park	$ 275,263	$ -	0%	$ 137,632	50%	$ 137,632	50%	$ -	0%	$ -	0%	$ -	0%
(2) N Minneapolis	$ 20,510,864	$ 13,229,033	64%	$ 3,840,687	19%	$ 3,344,701	16%	$ 96,444	0%	$ -	0%	$ 2,697,743	13%
(3) NE Minneapolis	$ 2,071,701	$ -	0%	$ 1,219,497	59%	$ 306,818	15%	$ 545,386	26%	$ 203,249	10%	$ 1,480,333	71%
(4) S Minneapolis	$ 19,881,035	$ 3,312,390	17%	$ 12,018,884	60%	$ 3,976,098	20%	$ 573,663	3%	$ 298,850	2%	$ 10,750,525	54%
(5) W St. Paul	$ 23,302,263	$ 15,436,331	66%	$ 4,647,588	20%	$ 2,341,315	10%	$ 877,028	4%	$ -	0%	$ 8,642,183	37%
(6) E St. Paul	$ 17,069,505	$ 12,092,578	71%	$ 2,066,777	12%	$ 2,203,442	13%	$ 706,707	4%	$ -	0%	$ 2,593,389	15%
(7) Downtown St. Paul	$ 442,219	$ -	0%	$ 212,663	48%	$ 197,514	45%	$ 32,041	7%	$ -	0%	$ 11,653	3%
(8) West Side, St. Paul	$ 3,322,591	$ -	0%	$ 2,523,061	76%	$ 672,816	20%	$ 126,714	4%	$ -	0%	$ 2,817,978	85%
All study areas	$ 86,875,442	$ 44,070,332	51%	$ 26,666,789	31%	$ 13,180,338	15%	$ 2,957,983	3%	$ 502,099	1%	$ 28,993,805	33%
Non study areas	$ 245,544,927	$ 221,635,758	90%	$ 9,641,044	4%	$ 9,765,685	4%	$ 4,502,440	2%	$ 1,126,727	0%	$ 7,790,426	3%

4.2 Neighborhood patterns in SNAP usage

The eight study areas identified in this research each have a significant net "outflow" of SNAP benefits (see figure 3.5), meaning that the amount of benefits distributed to SNAP clients living in these areas is higher than the amount of benefits redeemed at area stores. In all areas but one, this outflow is at least a third of the benefits received, and in two small areas (1 and 7) this figure approaches 100%. A comparison of net benefits at 5 and 2 km resolutions (figure 3.3), also shows the spatial distribution of this trend. At the 5 km scale, much of north Minneapolis and central/east St. Paul is marked in red, showing a net outflow of SNAP dollars. At the 2 km scale, an outflow of SNAP benefits are seen in much of north Minneapolis, the central part of south Minneapolis, and the north central region of St. Paul. The exceptions to this trend, marked in green to show an "inflow" of SNAP benefits, are cells containing one or more large supermarkets, such as the southeast corner of north Minneapolis and the western edge of St. Paul.

Closer examination of the four largest study neighborhoods (areas 2, 4, 5 and 6), shows some variation in this trend of net dollar outflows. Only one supermarket exists in north Minneapolis (area 2), and the estimated value of SNAP redemptions at this one store is roughly twice as much as any other SNAP vendor in the Twin Cities. However, as a whole, this area still had a net outflow of SNAP benefits that was 37% of area

redemptions. South Minneapolis (area 4) had an even larger outflow of SNAP dollars, 57% of area redemptions. However, when two supermarkets and a Target just to the outside of this area are included in the analysis, this figure becomes a modest 8% "inflow" of benefit dollars. Similarly, while western St. Paul (area 5) had only a 7% net outflow of SNAP dollars, much of that is due to a large retail development on the western edge of this area (in an area generally known as Midtown) that accounts for 50% of all redemptions. This is to say that the boundaries of both areas 4 and 5 make a significant impact on analytical results. At the very least, however, these results do show a net flow of SNAP dollars from the center to the edge of each of these neighborhoods. Lastly, eastern St. Paul (area 6) contains two supermarkets, which together account for 71% of benefit redemptions in the area (table 3.5). Similar to north Minneapolis, despite the presence of large supermarkets, this area saw a 37% net outflow of SNAP dollars during the study period, suggesting that the presence or absence of supermarkets in individuals' residential neighborhood may not be responsible for this trend of shopping elsewhere.

These data show that large food retailers play a significant role in providing food access in these communities. Still, as table 3.5 demonstrates, they play a less significant role in the eight identified study areas than in the rest of the metropolitan area. While superstores and supercenters together account for 90% of SNAP redemptions outside these eight study areas, within these areas they account for only 51% ($44 million out of

a total $87 million) of SNAP redemptions. Two store types accounted for the bulk of remaining redemptions in these areas, convenience stores and mid-sized grocers. Convenience stores in these study areas accounted for 15% of total redemptions ($13 million), compared to just 4% outside those study areas. Mid-sized grocers accounted for 31% of total redemptions ($27 million) and as much as 60% of redemptions in area 4. As defined in my classification, mid-sized grocers include a variety of store formats, including discount and independent grocers, stores catering to specific ethnic populations, and natural foods co-ops.

When selecting just stores catering to a particular ethnic group, a category that includes both mid-sized grocers and convenience stores, these stores account for totals ranging from 10% of all vendor redemptions in north Minneapolis to 54% in south Minneapolis, which is home to significant east African and Latino immigrant communities (table 3.5). Food cooperatives and SNAP accepting farmers' markets—vendors with a primary focus on sustainably produced foods—are uncommon in these neighborhoods. Cooperatives in northeast Minneapolis (area 3) and south Minneapolis (area 4) are the exceptions to this trend, each with an estimated $200,000-$300,000 in redemptions during fiscal year 2010. In northeast Minneapolis, one food cooperative accounted for 10% of total redemptions in the area. This demonstrates they key role these smaller stores play within the food economies of these areas.

Evaluating the destination of benefits leaving these study areas—that is, finding areas of "inflow"—is a challenging task. While benefit distributions form a more or less continuous surface, redemptions occur at discrete points. The highest levels of redemption occur at supermarkets/supercenters, sites which are spaced widely across the metropolitan area. At a fine scale, such as the 500 m or 2 km grids, net inflows of SNAP benefits show only on the presence or absence of these major food retailers. The coarser 5 km grid, however, is less susceptible to this problem. In figure 3.3, for example, almost all of northwest Minneapolis has a net outflow of SNAP dollars, despite the presence of a major supermarket whose effect is seen at the 2 km scale. Both the 5 km and 2 km grids suggest that a suburban retail center directly north of this area may be a place where residents redeem their benefits. Similarly, the 5 km map highlights how the western edge of St. Paul, the Midway neighborhood, sees a significant inflow of SNAP dollars. This neighborhood is home to several major food retailers, which may contribute to this effect.

One other trend in these data also deserves note. The benefits distributed to SNAP clients in each study area increased 11% at a steady rate over the course of this fiscal year. SNAP redemptions at vendors, however, showed strong variation from month to month. This trend is not isolated to the Twin Cities or just Minnesota. The USDA's national data for every state except for Rhode Island and Alaska during the five year period 2008-2012 show a median decline of 2.8% in benefit redemptions in February

(table 3.6). Median declines of between .5% and 1.3% are also seen in January, June, September and November. SNAP benefits do roll over from month to month, which makes such variation possible. However, the exact reasons for this variation are not clear, and I have found no other explanation for this trend (or even a recognition that it exists) in existing research on SNAP benefits. This issue may partly be an artifact of months with fewer days, especially in states that distribute benefits in the middle of the month. However, given that most SNAP clients spend most of their benefits within two weeks of receiving them, other factors may also influence this variability (Castner & Henke, 2011, p. 32).

Table 3.6: Average monthly change in benefit redemption, all US states, FY 2008-2012

	Average	St Dev	Median
Jan.	-1.94675	6.452433	-1.30202
Feb.	-0.83524	13.44853	-2.81276
March	6.935882	2.27951	6.757176
April	1.914018	1.061965	1.923819
May	2.784535	2.330944	2.370132
June	-0.97499	1.488819	-0.68271
July	2.582529	1.998435	2.286978
Aug.	0.870587	0.967606	0.973739
Sept.	0.490057	8.102607	-0.77825
Oct.	4.100751	3.418692	4.462187
Nov.	0.460731	6.815756	-0.54644
Dec.	3.265778	2.571509	3.355105

5 Discussion

Analysis of these data provides several useful insights into food procurement practices in low-income neighborhoods. Most significantly, this analysis lends support to existing findings that residents of these neighborhoods routinely travel significant distances in shopping for food (Ledoux & Vojnovic, 2012; Zenk et al., 2011). Each study area included in this research saw a net outflow of SNAP benefits, suggesting that many or even most SNAP clients use their benefits at food stores outside their neighborhoods. While current USDA data restrictions make tracing the flow of benefits outside the neighborhood difficult, the large net outflow of benefit dollars seen in the highest poverty areas, combined with the inflow of dollars present in suburban or more affluent urban neighborhoods, suggest that SNAP clients often do their food shopping outside their residential neighborhood. These data do not explain the reasons for this trend, but ongoing related case study research in north and south Minneapolis does show that the perception of better prices, food quality, and service in suburban stores are main contributing factors. This may partially explain why this net outflow of benefits is seen even in neighborhoods like east St. Paul (area 6), which contains two major supermarkets.

This finding is also significant given that the majority of current food desert research measures neighborhood effects around individuals' place of residence.

Certainly, residential context matters, but this finding suggests that low-income urban residents "have more resources than it may appear" (Rogalsky, 2010a), especially with regards to mobility. This is not to say that these individuals are not spatially constrained by their economic circumstances. Instead, rather than assuming low-income populations are immobile, future research could focus on the *differential forms of mobility* available to this group and how these in turn influence practices of food procurement and consumption. For example, such research could study how residents barter for rides or make use of public transit systems, and how this affects food shopping when compared with fellow neighborhood residents who have reliable automobile access. Ongoing case study research related to this project supports the finding that residents often travel outside their neighborhoods for food, but with a significant opportunity cost in terms of the duration and timing of trips. A broad literature on mobilities in sociology and geography, which focuses on the relationships between mobility and social identity, provides a theoretical framework for such research (Conradson & Latham, 2005; Cresswell, 2006; Urry, 2007). Fundamentally, this study calls a basic assumption of much neighborhood effects research into question: that it is only neighborhood of residence that provides contextual influence on health outcomes. While health effects may be discernible at the neighborhood scale, their contextual influences may be geographically

broader, at the very least including the extent of individuals' daily mobility and social networks.

While large supermarkets and supercenters account for the vast majority of SNAP benefit usage in the Twin Cities, within high poverty neighborhoods convenience stores and mid-sized grocers in low-income neighborhoods play a notable role, accounting for 46% of total SNAP redemptions in case study areas. This is not necessarily due to the absence of supermarkets, as most large areas had one or more supermarkets within their boundaries. Certainly, the negative role of convenience stores in low-income, urban communities has been scrutinized in past research, and interventions to encourage healthier offerings in these are present in a number of cities (Burtness, 2009; Larson, Story, & Nelson, 2009). Mid-sized grocers, however, include a much broader range of stores, including ethnic markets, discount grocers, and food cooperatives. While these stores often have higher prices and less variety in their food offerings, they may still provide access to a modest selection of produce and meats (Donald & Blay-Palmer, 2006; Short, Guthman, & Raskin, 2007). Ethnic retailers provide specialized goods that better fit the cultural backgrounds of neighborhood residents, such as kosher/halal meats or produce not available in mainstream groceries. Food cooperatives work more flexibly with local or alternative food producers, though this often results in higher prices. Since, in many cases, these stores are independently owned, they are sometimes excluded from

analyses of food access that feature only the most legible chain retail sites (Griffioen, 2011). Food discounters, such as Aldi or Save a Lot, may also be more modest in size but offer cheaper access to produce than conventional supermarkets. Because of their smaller form, these stores fit more readily into dense urban development. Thus, rather than incentivizing new retail development centered around big box stores such as Wal-Mart (Philpott, 2012), this research suggests efforts to improve urban food access might more constructively work to strengthen the food offerings available at mid-scale retailers already playing a significant role in low-income neighborhoods. This research also demonstrates the geographical unevenness of the SNAP program in practice, with patterns of usage in the urban core differing substantially from those of suburban and/or more affluent areas.

There are several limitations to this study. First, this analysis relies on estimated store-level SNAP redemptions. Given the difficulties of accurately classifying stores and distributing benefits accordingly, the figures listed here are all approximate. A more accurate analysis would be possible if the USDA were to provide restricted access to store level data, akin to what is already available for census data and for surveys such as the National Health and Nutrition Examination Survey. Second, this data is only for SNAP benefits, used as a proxy here for overall food procurement. Potentially significant sources of food are not incorporated in this data, such as food shelves, most farmers'

markets, or informal bartering among friends and family. Some immigrant populations, most notably Latinos, are underrepresented in SNAP, and so their food shopping habits may not match with this analysis (USDA, 2009). Third, these data is for one metropolitan location over a single year. The findings listed here may not be broadly representative of cities in different regions or countries, particularly when these involve different urban forms, transit systems, or retail landscapes. As noted above, however, the findings related to both shopping mobility and the role of mid-sized retailers are consistent with broader research. Lastly, these data provides no information on the foods purchased with SNAP benefits, making a nutritional or dietary analysis across store types impossible.

6 Conclusion

This analysis of SNAP benefits provides an alternative framework for studying food access in low-income neighborhoods. It both complements existing spatial analyses by focusing on proxies for the food procurement practices of low-income individuals, rather than simply focusing on the supply of foods within their neighborhoods. This initial research provides evidence for the mobility of SNAP clients, showing that a large proportion of benefits are used outside of their neighborhoods. While a person's place of residence may play a significant role in their food consumption decisions, these data underscore the need to examine how access to transit and overall mobility, combined

with a desire for lower prices or quality foods, shape food procurement. In addition, it may also be useful to consider the potential intersections between transit systems and urban food planning, two areas which thus far have had little collaborative work. For example, placing farmers' markets or mid-sized healthy food retailers near nodal points in the public transit system may result in increased use of these sites. Large food retailers may still play the largest role in the use of SNAP benefits, but these data also show that in core urban areas, smaller retail sites still play a significant role. This bolsters support for healthy corner store initiatives and encourages partnerships with independent and ethnic food retailers. Farmers' markets play an extremely limited role in the direct use of SNAP benefits, in part due to the small number of authorized sites during the study period. However, as the ability to use SNAP benefits at farmers' markets continues to expand rapidly nationwide, this is a pattern that may change (Briggs et al., 2010).

This research develops a new source of data on neighborhood level food access. While SNAP data have been analyzed in the past to determine the effectiveness of the program at reducing food insecurity and improving health outcomes, the geographic patterns of benefit distribution and usage have received little attention. Publically available data at the county or zip code level provides some insight on benefit usage at a broad scale. By using dasymetric mapping techniques, however, these data can be disaggregated to a much finer scale, allowing analysis at the neighborhood level and the

ability to analyze at multiple scales, limiting the possibility that results will be biased by boundary effects and the modifiable areal unit problem. The results of this approach provide only estimated values, and this research required that all stores in the study area be classified by type. Still, this project provides a model on which future research can build to better understand the landscape of food access in low-income neighborhoods.

Indeed, though this initial descriptive analysis provides insight into food shopping patterns in low-income neighborhoods, data on SNAP usage have more significant potential value in pointing to changes in food access over time. As these data are available at a monthly level, they can show the effects of interventions meant to improve food access, such as the creation of new supermarkets. In combination with demographic data, SNAP data can show how patterns of food access are also affected by broader changes in neighborhood composition or by economic downturns such as the recent economic recession. Multi-city analyses can also suggest how food access is affected by differences in urban form or in the food retail landscape. This research could strengthen understanding of the wide array of neighborhood or regional level factors shaping food access.

While all these analyses are possible with data that are currently publically available, the accuracy and ease of this research would be strengthened if finer scale data on SNAP usage were made available, even on a restricted basis. In particular, having

access to store level SNAP redemptions would ameliorate the errors in estimation possible in the process outlined in this paper, a process that is also time intensive due to the need for individual store categorization. Procedures for accessing this data could be similar to those for accessing census microdata, with associated costs paid for through research funding. Developing a process to access this data would no doubt be complicated, but the benefit would be a greatly increased understanding of the factors shaping food access for low-income individuals.

Chapter 4

Rethinking food deserts: mobility, gray spaces, and social networks

1 Introduction

Over the last decade, work on hunger, nutrition, and obesity has increasingly focused on the role of so-called "food deserts," low-income communities where culturally appropriate healthy foods are not available, overly expensive, or of poor quality. This lack of food access, it is argued, results in poor dietary choices and higher rates of obesity, along with its associated health effects. In addition to numerous articles defining and measuring the extent of food deserts, policy makers and public health professionals have initiated several initiatives meant to mitigate their effects, often by incentivizing the creation of new grocery stores in targeted areas ("Pennsylvania Fresh Food Financing Initiative," 2011; Shute, 2012). These have ranged from policy initiatives at the municipal, state, and federal scale (Food and Fairness Inquiry, 2010; "Pennsylvania Fresh Food Financing Initiative," 2011; Shute, 2012; U.S. Department of Heath and Human Services, 2010) to pledges by large retailers including Wal-mart and Whole Foods to open new locations in underserved areas (Bomey, 2013; Reese, 2013).

Despite its political currency, research on food deserts has come under question, with a 2012 front page New York Times story citing several research studies that failed

to find a link between geographic food access and health related outcomes (Kolata, 2012). Others have suggested that it might be time to "ditch" the term altogether (Holt, 2013) or substitute a more suitable alternative such as a "food swamp" (Fielding & Simon, 2011) given that the plethora of highly processed foods in these areas makes the desert metaphor problematic. Aside from these debates on terminology, this paper focuses instead on the ways these spaces are conceived of and measured. In much current research, neighborhood residents are conceptualized as being confined to their place of residence and doing their shopping only at food retail locations in their immediate neighborhood. Much existing work makes heavy use of GIS tools meant to measure individual exposure, such as buffers, assuming a stationary subject and privileging physical distance as a key metric. The resulting analyses emphasize the need to improve neighborhood food supply at the expense of asking how, where, and why residents of the neighborhood get food. Put more simply, much current work in this area focuses on the *proximity* of food sources rather than on the factors that influence food procurement in *practice.*

This paper focuses on the latter issue, drawing on a mixed method study of food procurement practices in Minneapolis/St. Paul, Minnesota, commonly known as the Twin Cities. The first section of this paper outlines current research on food deserts. This research often excludes the everyday mobility of even low-income urban residents, a

factor made more salient by a recent studies showing little association between individuals' residential neighborhood and overweight status (An & Sturm, 2012; H. Lee, 2012) and that residents often travel outside their neighborhoods to procure food (Ledoux & Vojnovic, 2012). As an alternative, work in critical GIS models another approach for analyzing the everyday mobilities of urban residents. This research builds on the mixed methods approaches favored by many in critical GIS, using both broad scale quantitative analysis along with largely qualitative case study data to better understand the geography of food procurement in targeted neighborhoods.

The second section of this paper describes my methodology, which is divided into two major approaches. The first section of this study is based on disaggregated data on benefit utilization in the Supplemental Nutrition Assistance Program (SNAP, formerly known as food stamps), focusing on the spatial patterns in how these benefits are used by SNAP clients. The second part of this study, and the primary focus of this paper, is a case study conducted in two neighborhoods of Minneapolis where residents (total n=38) were asked to track their daily mobility and food procurement over a period of five days. This phase of the study also included semi-structured interviews with these participants about the sites where they procure food both during the study period and more generally.

The results of this analysis, described in the third and fourth section of the paper, highlight three problematic areas of conventional food desert research: its classification

of supermarkets as uniformly positive food sources, its common exclusion of mid-sized grocers in favor of large retailers, and its inability to capture the daily mobility of neighborhood residents who often travel outside their neighborhoods. I conclude by discussing the implications of this research. By re-thinking food deserts in ways that allow for greater ambiguity in store classification and do not constrain urban residents to neighborhood boundaries, future research might shift away from a model that simply leads to incentives for private retail to improve food access and instead build upon and enhance residents' already existing food practices and the diversity of their neighborhood "foodscape."

2 Food deserts: Context and critique

2.1 Measuring food deserts

Food deserts are generally defined as low-income communities where healthy foods are unavailable, of poor quality, and/or overly expensive. This lack of affordable, fresh produce and meats, combined with an abundance of candy, chips, and other nutritionally poor options, is assumed to contribute to high rates of obesity and its corresponding health problems. Academic research on food deserts dates from the early 2000s with the publication of several articles from a UK sponsored study on the subject (Cummins & Macintyre, 2002; Whelan et al., 2002; Wrigley, 2002). Research on food deserts quickly

spread to the U.S. (Block, 2006b; Zenk, Schulz, & Israel, 2005) and Canada (Apparicio et al., 2007; Smoyer-Tomic, Spence, & Amrhein, 2006). To date, almost all food desert research has been done in these three countries (for an exception, see Battersby, 2012).

In practice, food deserts have been studied using two main approaches. Early research mainly used a market basket approach, documenting disparities in food availability, quality, and pricing across store types and/or neighborhoods (Cummins & Macintyre, 2002; Hendrickson et al., 2006). These studies have often found significant differences between high poverty neighborhoods and their suburban and/or more affluent counterparts, though this did not always entail more expensive prices in low income areas (Block & Kouba, 2007; Bodor et al., 2007). Due in part to the complexity of market basket studies, most recent work on food deserts uses a spatial analytical approach. Here, differing store types are used as proxies for the foods they contain using a dichotomous classification: supermarkets are understood as the primary sources of affordable, nutritious foods while corner stores and fast food locations represent highly processed, nutritionally poor foods. By analyzing the geographic distribution of these stores against demographic data, spatial analyses of food deserts identify areas that combine poor geographic access to healthy foods (again, defined primarily by locations of supermarkets) with high levels of social deprivation as measured through poverty rates, access to transportation, and/or levels of education (G. Clarke et al., 2002; Zenk, Schulz,

& Israel, 2005). This research has become more analytically sophisticated over time, including analyses assuming multiple forms of transport (e.g., car, bus, walking), use of both distance and density measures to measure accessibility, and the inclusion and weighting of several demographic factors (Apparicio et al., 2007; Larsen & Gilliland, 2008). Maps of food deserts have direct policy relevance, both clearly diagnosing the location of these problematic areas and providing a geographic reference for targeting possible solutions, most often tax incentives promoting new food retail. This distance based approach has been adopted by the United States Department of Agriculture (USDA), whose online map of food deserts uses both poverty rates and distance measures to create a national atlas of food access.[8]

Despite its widespread use, this spatial analytical approach has been called into question by recent research finding no clear link between supermarket proximity and rates of obesity (An & Sturm, 2012; Boone-Heinonen et al., 2011; H. Lee, 2012). These studies found that while the food retail environment may well influence dietary and shopping behaviors, that influence is not significant when measured through the distance between stores and place of residence. The USDA similarly found in a 1999 study that recipients of food assistance often shopped at stores more than twice as far from home as the nearest major supermarket, a finding duplicated by other more recent studies on

[8] This atlas can be found online at http://www.ers.usda.gov/data-products/food-access-research-atlas.aspx

shopping behavior in low-income areas (Hillier et al., 2011; Ledoux & Vojnovic, 2012; USDA Economic Research Service, 2009, p. 63). A second issue in this research has been problems in the reliability of commercially distributed store listings and classifications. The accuracy of these listings, with respect both to the identification of store locations and their industry classification, also raise questions about the validity and reliability of spatial analyses. For instance, Powell et al. (2011) found that the accuracy rate of listed supermarkets in the Dun and Bradstreet and InfoUSA databases was only 60%. Independent groceries and smaller stores are even less easily tracked, casting doubts on the effectiveness of analyses using these commercial databases as a source.

Rather than using *proximity* (e.g., distance to and density of food stores) as the primary metric, this research focuses on how existing *practices* of food procurement in low-income neighborhoods are shaped by a variety of influences. These include the role of social networks, everyday mobilities, neighborhood context, and differing store formats in shaping how and where people get food. While current work often conceives of neighborhood residents as passive and immobile, influenced mainly by the retail landscape immediately surrounding their place of residence, this research begins by assuming residents are active and mobile subjects who can and often do travel out of their neighborhoods. This project thus proposes new ways of studying food deserts that incorporate the complex and heterogeneous ways individuals interact with the food

system. It suggests other paths forward than those which until now have mainly focused on increasing the food supply through the creation of new food retail.

2.2 Critical GIS and mapping everyday mobilities

GIS software currently plays a fundamental role in analyzing food deserts, providing the ability to easily geocode store locations, create buffers around these stores, and analyze these data against demographic information from the U.S. census. It is this ability to map the landscape of food access that renders food deserts easily calculable as discrete, bounded territories, a trait that certainly contributes to their current popularity among both policy makers and analysts (Shannon, 2013). However, the clarity and stability with which such maps depict space effaces alternative readings of the landscape. Harley, nearly 15 years ago, encouraged map viewers to "read between the lines of the map—'in the margins of the text'—and through its tropes to discover the silences and contradictions that challenge the apparent honesty of the image" (Harley, 1989, p. 3). Maps of food deserts certainly enable a certain kind of political mobilization—one aimed at increasing the supply of foods in low-income areas through a variety of interventions. By defining food deserts as fixed areas with clear boundaries, however, these maps erase the dynamic processes of daily life that constitute urban life. This is Haraway's "god-trick" or de Certeau's metaphorical observer perched atop the World Trade Center,

focused on the broad networks of streets and buildings but unable to see the myriad of ways those on the ground actually move through urban space and oblivious to the processes that shape these everyday practices (Certeau, 2000; Haraway, 1988).

These concerns are hardly unique, with related vibrant research currently underway in both the new mobilities paradigm (Conradson & Latham, 2005; Cresswell, 2003, 2006; J. Shaw & Hesse, 2010; Sheller & Urry, 2006) and in critical GIS (M.-P. Kwan, 2002; M. Pavlovskaya & Martin, 2007; M. Pavlovskaya, 2006; Sheppard, 2005)[9]. Researchers in both these areas have been consistently skeptical of spatial analysis that assumes a static and easily demarcated spatial landscape. In Cresswell's view (2003), a distanced view of landscape "obliterates" the practices which produce and maintain it, and he calls instead for "geographies that are lived, embodied, practiced; landscapes that are never finished or complete, not easily framed or read. These geographies should be as much about the everyday and unexceptional as they are about the grand and distinguished" (p. 280).

Within critical GIS, research has often sought ways to bring out the everyday experiences of women and/or ethnic minority populations through blending GIS tools with qualitative data. Kwan has written on this issue extensively with several co-authors (M.-P. Kwan & Ding, 2008; M.-P. Kwan, 1999, 2000, 2002; Ren & Kwan, 2007). One

[9] This research has gone under a number of headings, critical GIS (O'Sullivan, 2006; Sheppard, 2005), feminist GIS (Gilbert & Masucci, 2006; M.-P. Kwan, 2002), and qualitative GIS (Cope & Elwood, 2009; Knigge & Cope, 2006) most prominently. Work on public participatory GIS (PPGIS) is also closely related (Elwood & Ghose, 2001; Hawthorne, Krygier, & Kwan, 2008).

much cited piece, for example, used travel logs and interviews with Muslim women soon after 9/11 to map how what had been routine daily trips to school and work became significantly shortened and filled with anxiety (Mei-po Kwan, 2008). She has also been particularly insistent on the need to study the "unknown geographic context problem," which explicitly asks how a neighborhood's contextual influence may be mediated by time-space geographies (MP Kwan, 2012). Other research has questioned the efficacy of formal economic data in analyzing the daily practices of marginalized groups. In her study of changes in the informal economy of households in one Moscow neighborhood after the fall of communism, Pavlovskaya (2002) investigated whether the rapid growth in the service economy after the transition improved the daily lives of the women she spoke with. She found that these women found the stores in their neighborhood either overly expensive or not applicable to their daily needs and thus travelled well outside their neighborhood to get goods and services. Both Rogalsky (2010a) and Matthews et al (2005) used tracking and interview data to map the daily trips of welfare clients, showing how family commitments, shopping needs, and institutional demands meant regular long-distance trips, often using public transit, at a significant cost in both time and money. Knigge and Cope (2006) used grounded visualization, involving analysis of demographic data and participant-observation within neighborhoods, to analyze the political battles over vacant lot space in Buffalo, NY. They paid particular attention to community

gardens and the ways they functioned as sites that both welcomed and sometimes provided resistance to capital fueled community redevelopment, making this one of the few attempts to use an explicitly "qualitative GIS" approach to studying urban food systems (Cope & Elwood, 2009). In sum, work on critical GIS and mobility has challenged analyses of urban space that rely solely on formal economic data and sought to better visualize the everyday geographies of economically marginalized populations. It has often done so by using GIS in tandem with qualitative methods to represent the daily lives of selected individuals.

One of the primary contributions of critical GIS has been in this blending of methodologies. However compelling its conclusions, however, it has remained somewhat limited in scope by virtue of its small sample sizes and focus on individual narratives. Rather than focusing primarily on merging qualitative epistemological approaches with GIS techniques, as has been the case in much of this work, an alternative is to combine both quantitative and qualitative components in a research project in ways that preserve their respective strengths—breadth of view and analytical clarity in the case of quantitative work and the interpretative richness and nuance of qualitative approaches. The triangulation that results is not necessarily aimed at determining "an object's exact location" (Jick, 1979, p. 602), but to investigate a question using multiple epistemological approaches. Confirmation of patterns across methodologies certainly matters, but so do

the “gaps and tensions between differing forms of knowledge” (Elwood, 2009, p. 99) which provoke reflexivity from researchers. In this approach, the use of multiple methods provides a broader, more complex, and not fully coherent view of a world that always exceeds our epistemological grasp (Nightingale, 2003 makes a similar point). Robbins (2003) provides one model, combining a GIS based analysis of remote sensed data on land cover in India with indigenous readings of the landscape provided by local farmers to reveal the “convergence and divergence” of these two views.

Building on and extending work in critical GIS, this project uses a mixed methods approach to investigate alternative epistemologies for food desert work and identify problematic absences in conventional approaches. Rather than define low-income areas through a lack of adequate food supply, this approach focuses on existing practices of food procurement and the ways they interact with environmental and social factors. This research challenges fundamental assumptions of conventional food desert work, most notably the use of place of residence and supermarkets as proxies for individuals’ location and healthy foods respectively. The goal is not to treat spatial analytical techniques as a priori objects of suspicion. Instead, I argue that more focused attention on the everyday practices of urban residents, drawing from both quantitative and qualitative data, may lead to improved conclusions about the factors limiting food access in low-

income neighborhoods and to more sophisticated analytical approaches better attuned to the ways these residents feed themselves and those they care for.

3 Research setting and methods

3.1 The Twin Cities metropolitan area

The setting for this research was the seven county Twin Cities metropolitan area, comprising the cities of Minneapolis and St. Paul and their associated suburban areas. In the 2010 U.S. Census, this metropolitan area had a population of 3.3 million. While the metropolitan population as a whole is predominantly European-American, it has significant populations of African-American (7% of the total population in 2011 American Community Survey data), southeast Asian (4%), sub-Saharan African (4%), and Latino residents (6%). The Twin Cities have a vibrant and diverse system of food retailers, including major supermarkets, smaller chains including Aldi and Trader Joe's, a robust network of 13 food cooperatives, and multiple farmers' market and community garden sites, including large markets near both downtown Minneapolis and St. Paul. In addition to a substantial freeway infrastructure, Minneapolis has been ranked as one of the most bicycle friendly cities in the country. Public transit is comprised primarily by a bus system but also includes two recently built rail lines.

The case study portion of this research focused specifically on neighborhoods in south and north Minneapolis. The boundaries of these study areas were based on an analysis of SNAP data (described below), but modified slightly to reflect street boundaries more easily identified by residents (fig. 4.1). No one ethnic group comprises a majority of the population in these areas, and they each have a low median household income of about $32,000 (table 4.1). These two neighborhoods do differ substantially in their food retail landscape. North Minneapolis has only about a third the number of SNAP accepting locations (38) as south Minneapolis (108), including only one major grocery store, two discount grocers (Aldi and So Low Foods), and four Asian supermarkets. South Minneapolis has three major groceries and a Target store, along with a substantial number of small grocers catering to the neighborhood's Latino and East African populations. The contrasting "foodscape" of these neighborhoods (Lake, Burgoine, Greenhalgh, Stamp, & Tyrrell, 2010), combined with their demographic similarities, provides an opportunity to examine how differences in the store environment impact patterns of food procurement, potentially providing residents with better options closer to their homes.

Table 4.1: Case study area demographics

	Twin Cities demographics		
	N. Minneapolis	S. Minneapolis	Twin Cities
Population	44,535	59,874	3,318,486
Median age	28	29	36
Median hh income	$ 32,730	$ 32,524	$ 79,922
% White	24%	41%	81%
%African-American	50%	26%	7%
% Asian-American	14%	3%	6%
% Latino	8%	31%	5%
% with diploma	76%	74%	93%
% with college degree	17%	28%	39%
% SNAP households	34%	24%	8%
% households with a car	76%	71%	92%

Source: U.S. Census 2010 and 2007-2011 Am. Community Survey

	Case study participants	
	N. Minneapolis	S. Minneapolis
Total participants	18	20
Median age	46	43
Median hh income	$ 15,684	$ 11,400
White	6	8
African-American	8	5
Hmong	4	N/A
Latino	N/A	7
High school diploma	15	18
College degree	7	6
SNAP recipients	12	12
Access to a vehicle	9	12
Male	5	10

Female	13	10

Table 4.2: SNAP utilization in the case study areas. Parenetheses denote negative values.

		N. Minneapolis	S. Minneapolis	Twin Cities
SNAP benefit usage	Payments	$ 31,572,600	$ 23,510,100	$ 345,459,947
	Redemptions	$ 20,425,403	$ 28,970,009	$ 334,810,958
	Inflow/outflow	$ (11,147,197)	$ 5,459,909	$ (10,648,989)
Vendor redemptions (% of total redemptions)	Supermarkets/ supercenters	$13,229,033 (65%)	$15,825,755 (54%)	$265,706,090 (79%)
	Midsized grocers	$3,840,687 (19%)	$8,573,464 (30%)	$36,307,832 (12%)
	Convenience stores	$3,259,240 (16%)	$2,618,211 (9%)	$22,946,023 (7%)
	Other	$96,444 (.5%)	$1,952,579 (7%)	$7,460,423 (2%)

3.2 SNAP data and neighborhood case studies

This research project has two main components. The first section was an analysis of data on SNAP benefit usage for the metropolitan area during fiscal year 2010, provided at the zip code level. This dataset was disaggregated using dasymetric mapping techniques to make it more usable at the neighborhood scale (Eicher & Brewer, 2001; Mennis, 2003). Dasymetric mapping, a subset of larger methods of areal interpolation, uses underlying, finer scale data to disaggregate existing data to smaller areal units. In this case, I have used a combination of demographic data at the tract level from the U.S.

Census, data on residential zoning, and land use imagery to create very fine scale estimates (30m resolution raster images) of SNAP benefit distribution to clients. I created store level estimates of SNAP redemptions using reported SNAP redemption patterns for the metropolitan area as weighting variables. Based on this data, I have identified eight neighborhoods with high concentrations of SNAP clients. I analyzed the net "inflow" or "outflow" of benefit dollars in each area and also tallied patterns of redemption by store categories for each neighborhood. This approach to comparing benefit distribution and redemptions was necessary because SNAP data on these two functions are held by separate agencies, making it difficult to follow benefits from client to retailer. A fuller description of both the methods and results of this analysis can be found in related publications (Shannon, in progress; Shannon & Harvey, 2013).

The second phase of this study, which is the primary focus of this paper, was a case study based in north and south Minneapolis (fig. 4.1). A quota sampling method was used in each of these neighborhoods, with a focus on recruiting roughly equal numbers of white, African-American, and immigrant populations (Latinos in south Minneapolis and Hmong in north Minneapolis). A summary of study participants (n=38) is provided in table 4.1. These participants were recruited primarily through posting flyers in public spaces (e.g., libraries, sign posts, neighborhood centers) along with advertisements on the online classified system Craigslist.

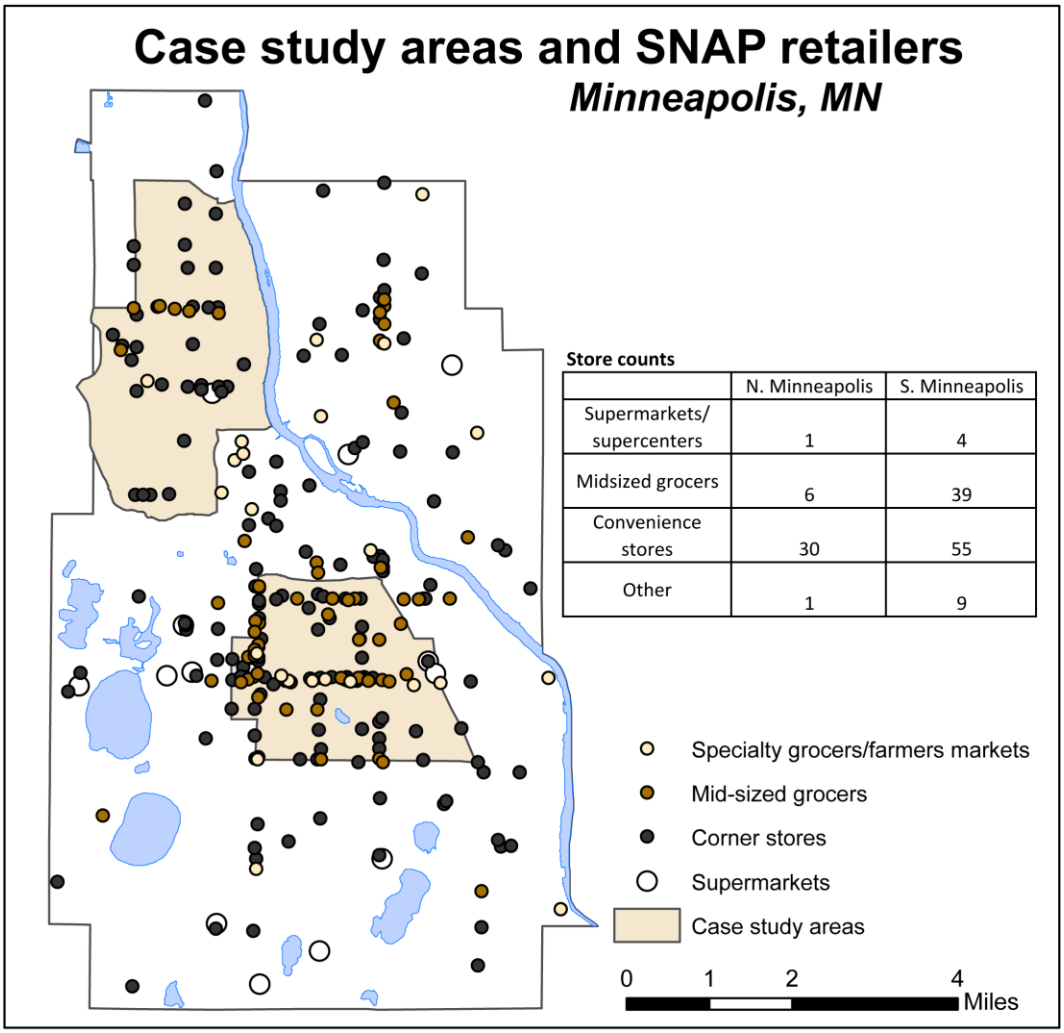


Figure 4.1: Neighborhood case study areas and store profiles

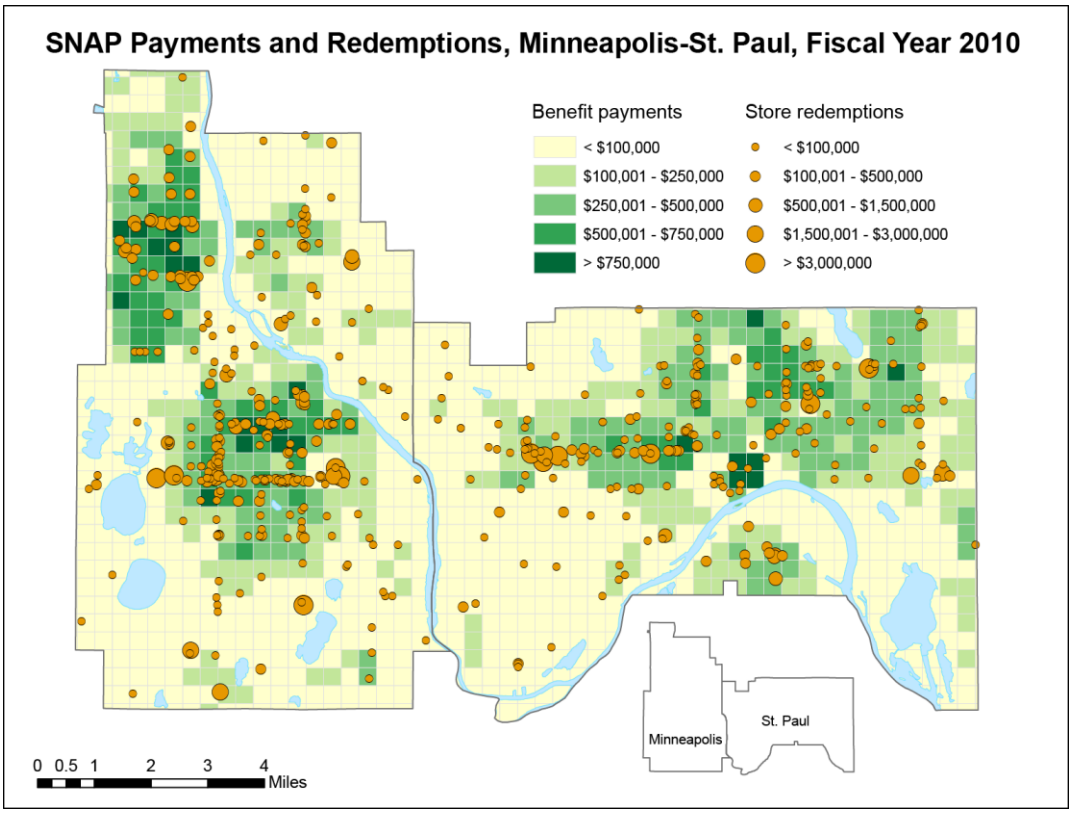


Figure 4.2: Estimates of SNAP benefit usage in the Twin Cities

Study participants took part in a five day study period, a time frame chosen to be both long enough to capture several shopping trips but short enough for participants to easily recall. The dates of this study period were flexible, though it had to include three weekdays and two weekend days. During this time, participants kept a diary of their entire food procurement, including food shopping, visits to food shelves, eating out, or eating at friends' houses. This diary listed time of day, means of travel, foods received,

amount of purchase (if any), and number of fellow shoppers and their relation to the participant. Participants received an Android phone with which they took photos of the places they procured food and the food itself. To better understand how participants' food shopping corresponded with their daily mobility, GPS software on these phones also tracked their daily mobility during this time, registering locations at five minute intervals.[10] I modified this data to obscure participants' place of residence, and plotted it using ESRI's ArcGIS software (fig. 4.3). I entered participants' food diaries into a unified spreadsheet, and the distance of each food source from participants' place of residence was calculated and visualized also using ArcGIS software. The use of mobile phones in this study to both track daily mobility and provide a street level view of participants builds on mobilities research in which mobile technologies act as a virtual presence for the researcher (Pelckmans, 2009; Spinney, 2011). In addition to this five day study period, participants also took part in two in-person interviews. The initial interview happened prior to the study period and included details about the study and a short survey on participants' background and general food procurement practices. The second interview was a follow up to the study period and included semi-structured questions about participants' mobility and food procurement during that time.

[10] Three different GPS applications were used over the course of this study: Instamapper (now discontinued), OpenPaths (developed by the New York Times), and FollowMee. The last of these proved the most reliable program for this task.

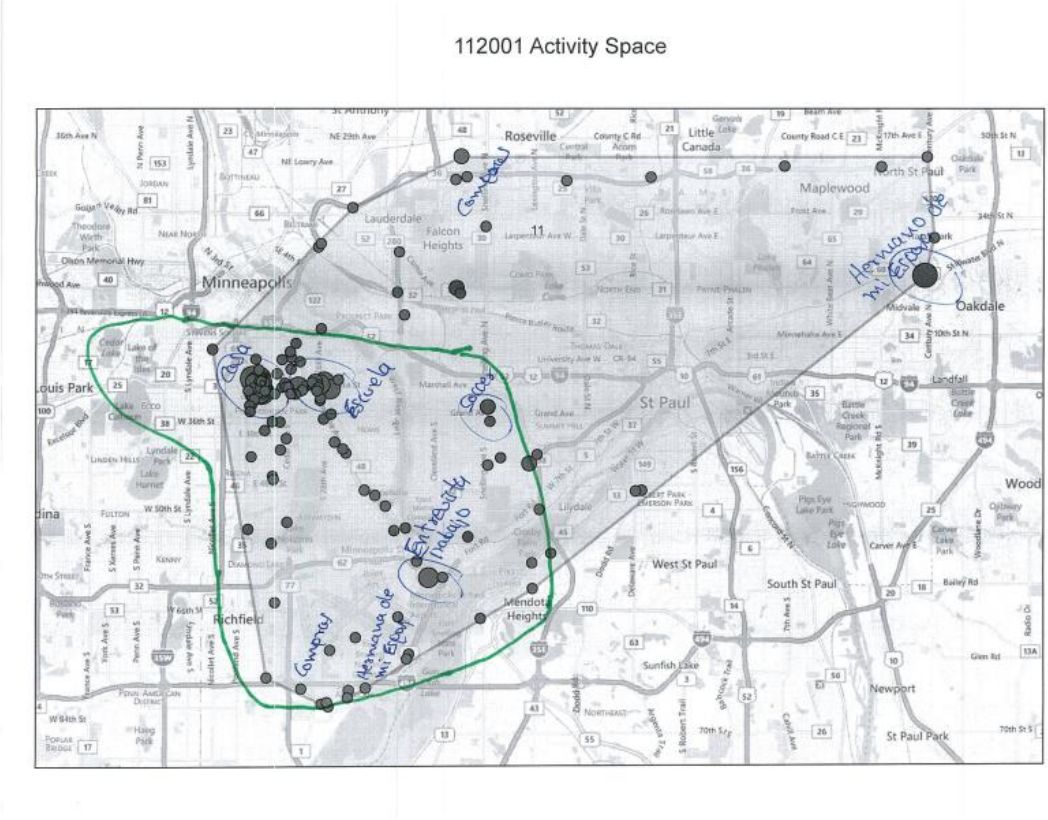


Figure 4.3: GPS data from a study participant with significant sites labeled. The green line is the participants' neighborhood as she would draw it.

4 Study results

4.1 Differences in supermarket prices/quality and neighborhood stigma

In most food desert research, large food retailers (supermarkets and supercenters) are accepted unproblematically as sources of low cost, healthy food. Analytically, this means coding all stores in the same way, regardless of the ownership structure or

location. However, results from both SNAP data and the neighborhood case studies told a more complicated story. Analysis of SNAP data showed a net "outflow" of dollars in almost all SNAP neighborhoods, with the one exception being south Minneapolis which showed a small net "inflow" when three large stores at the edge of this area are included (Shannon, in progress). This was true regardless of the presence of supermarkets within each area. While the structure of SNAP data makes it difficult to identify exactly how residents in these areas use their benefits, this result strongly suggests that a significant proportion of benefits are used outside of clients' residential neighborhoods, even when major supermarkets are nearby. In both north and south Minneapolis, supermarkets still account for 65% and 54% of SNAP redemptions specifically, but both these numbers are still well below the Twin Cities average of 79%, showing that these stores play a significant but not overwhelming role in residents' food shopping practices.

Case study data told a similar story. While both neighborhoods contained grocery stores, these local stores were not necessarily the primary destination of residents' food shopping trips. As table 4.3 shows, the mean distance of supermarket trips made by study participants exceeded the mean distance of all shopping trips across neighborhoods and vehicle ownership. In north Minneapolis, supermarket trips were 718 meters longer on average, and in south Minneapolis, the area that had far better access to supermarkets, supermarket trips averaged 1,763 meters longer. The relatively long distances travelled

by participants show that participants often travelled to stores some distance from their place of residence, in contrast to mid-sized grocers and convenience stores, which were often much closer to home. Similarly, figure 4.4 provides maps of all shopping trips made by study participants, grouped by neighborhood of residence and vehicle ownership. The wide spread of visited supermarket locations, shown as large red dots on each map, also demonstrates the range of stores both within and outside the case study areas used by participants. Though not close to home, these stores made up the largest share of participants' food shopping expenditures, reinforcing that they played the most significant role in residents' shopping habits.

Case study interviews provided some explanation for this trend, especially in north Minneapolis. Even when comparing stores in the same chain, case study participants noted significant differences customer service, as well as price and quality, as major influences over their decisions about where to shop. Tasha[11], an African-American woman who lived across the street from the north Minneapolis Cub Foods, said that the store was "awful" and that she would never shop there. This was partially due to food prices, which she thought were higher when compared both to suburban supermarkets and to stores in Chicago, where she spent the early part of her life: "It could be your grandmother or my grandmother that has to come over to this Cub and pay $4.99 a pound

[11] All names are pseudonyms

for ground beef. You might as well stick a gun to my head, because it's robbery." Another African-American woman, Cynthia, had worked at Cub Foods in both north Minneapolis and in suburban locations and also felt the prices were higher in north Minneapolis. As she saw it, this was in part due to the large numbers of low income people in north Minneapolis. In Cynthia's opinion, without the purchasing power of more mixed-income communities, profit margins at the north Minneapolis Cub Foods had to be higher to keep it running.

Table 4.3: Case study shopping data

		North Minneapolis			South Minneapolis		
		Car	No car	Total	Car	No car	Total
	# participants	9	9	18	12	8	20
	Mean monthly income	$ 1,486	$ 304	$ 895	$ 1,650	$ 931	$ 1,363
Trips	Total	47	51	98	81	38	119
	Supermarket	14	23	37	16	9	25
	Mid-sized grocer	4	8	12	9	7	16
	Convenience	9	5	14	15	8	23
	Fast food	9	7	16	22	6	28
	Restaurant	4	1	5	11	2	13
	Other	7	7	14	8	6	14
Dollars spent	Total	$ 1,194	$ 1,325	$ 2519	$ 1,964	$ 737	$ 2701
	Supermarket	$ 457	$ 840	$ 1297	$ 919	$ 335	$ 1254
	Mid-sized grocer	$ 467	$ 410	$ 877	$ 534	$ 192	$ 726
	Convenience	$ 77	$ 32	$ 109	$ 128	$ 71	$ 199
	Fast food	$ 101	$ 42	$ 143	$ 236	$ 25	$ 261

	Restaurant	$ 92	$ -	$ 92	$ 124	$ 45	$ 169
	Other	$ -	$ -	$ -	$ -	$ 69	$ 69
Distance* (meters)	Mean of all trips	6,806	4,909	5,819	3,731	5,914	4,428
	Supermarket	7,152	6,163	6,537	4,387	9,399	6,191
	Mid-sized grocer	5,112	1,268	2,549	3,510	869	2,354
	Convenience	7,277	2,349	5,517	1,223	537	984
	Fast food	8,544	10,417	9,364	3,556	8,149	4,540
	Restaurant	10,152	1,278	8,377	5,567	17,223	7,360
	Other	2,327	1,790	2,059	5,326	7,740	6,361

*Trip distance is calculated using Euclidean distance from place of residence

Food quality and variety was also another issue in north Minneapolis. Mary, a white woman who lived in north Minneapolis but worked in a southern suburb, enjoyed shopping at the north Minneapolis Cub Foods, describing it as a place to see neighbors and where people were more "real" with each other. However, she also noted the poor quality of the produce there and at the end of our interview stated that perhaps she would be better off shopping at a Cub Foods closer to her workplace that had better options. Bernice, an African-American woman, felt that Cub Foods catered too heavily to the neighborhood's African-American population and preferred Sun Foods, an Asian supermarket located in a near northern suburb, for the greater of variety of produce available there.

Participants in south Minneapolis also noted how some store features found in suburban stores, such as full salad bars and delis, were either missing or more modest in urban locations. Elena, a Latino woman from south Minneapolis, compared the quality of foods at her local Cub Foods to the one in suburban Richfield in this way: "When we go to the [local store], the produce isn't as good as at that one. When we go there the fruit is crushed, and if we are looking for some type of produce there isn't any left. The prices are higher than normal in other Cub Foods."[12] Elena, like many Latino participants, split her shopping between supermarkets and other stores selling distinctly Mexican foods,

[12] Spanish quotes have been translated for ease of reading

such as breads and produce. The use of smaller ethnic grocers to fill out regular shopping trips is discussed more in the next section.

While more difficult to define, store atmosphere and customer service were also often described as poor in both south and north Minneapolis. Tasha described the north Minneapolis Cub Foods as an unwelcoming place to shop, a trait she attributed to management's hiring of local residents who know how to "stack cans on a shelf" but lack a "welcoming attitude so that people will want to come back." Cynthia also described how, based on her experience, managers at the north Minneapolis Cub worked to keep employees at part time status (under 32 hours/week) in order to keep benefit costs down during her time working there, a move which could affect the quality of the store's employees. Others variously described this Cub Foods as cramped or dirty, again compared to better maintained stores in the suburbs. In south Minneapolis, both the Cub Foods and Rainbow Foods in the neighborhood also received mixed reviews. This was in part due to the greater ethnic diversity of that neighborhood, which resulted in a more diverse workforce and store offerings. Brian, a white man who moved to the neighborhood from the suburbs after a recent divorce, found the south Minneapolis Cub Foods somewhat bewildering when compared to one in suburban Coon Rapids:

> There's a lot of diversity down here and sometimes it's hard to get through to people that are, where there's a language barrier. Or a religious barrier.

> Up there in Coon Rapids, you get in and you can ask somebody, you'll be able to understand them and they'll tell you where you need to go and you can leave. But here you might have to stand around and ask two or three people before you get someone who understands what you're talking about.

While Brian's attitude reflects his position as a white transplant to the central city, his general complaints about the quality of workers at neighborhood supermarkets were shared by many participants.

The immediate neighborhood environment also factored into individuals' decisions which supermarket to go to, though again this was most common in north Minneapolis. West Broadway Avenue, the commercial artery that bypassed the store, was road to be avoided in many participants' opinion because of both vehicle and pedestrian traffic and reasons of personal safety. Nick, a 24 year old white man who was exceptionally tall, said it was better for him to stay away from that area as young African-American men would often try to pick fights with him. One Hmong woman said traffic made driving and parking around Broadway inconvenient and another reported almost falling victim to a purse snatching outside the north Minneapolis Cub. Moua, a female Hmong participant, did disagree with this sentiment, saying, "No, [Cub on Broadway] is actually convenient. There's bus routes that go there, there's even a—even a police office in there. It's not

scary unless *you're* scared." Still, more north Minneapolis residents agreed with the participant who described their feelings about shopping in their neighborhood in this way: "I live in the 'hood, but I hate it."

In sum, these responses show that not all supermarkets are seen equally by area residents, even those stores within the same chain. This is most clearly evident in north Minneapolis, but is true to a lesser extent in south Minneapolis as well. Differences in store features, the quality and price of foods, store atmosphere and employees, and neighborhood context all contribute to these perceived differences, which sometimes lead to participants choosing more distant suburban supermarkets over closer options. This is not to say that neighborhood stores are completely avoided. Both the analysis of SNAP data and this neighborhood case study show that neighborhood residents make extensive use of local stores, with especially high redemptions at the north Minneapolis supermarket many participants so disliked. Rather, this evidence shows that residents have a deep ambivalence about these stores, putting up with their problematic areas when needed but also seeking out better options when they are available. In this sense, supermarkets, especially those in low-income areas, are a kind of grey space in the minds of the participants I spoke with, in contrast to the uniformly positive treatment they receive in much research on food deserts. While these neighborhood stores offer better food quality and selection than other nearby food options, when compared to options in

middle class suburban neighborhoods, these stores come up short.

4.2 The ambivalent role of mid-sized grocers

Much current research on food deserts pits the affordable, abundant healthy foods at supermarkets against expensive and highly processed options at corner stores. This framing neglects what I term mid-sized grocers. This category includes independent and/or ethnic grocers, discount grocers such as Aldi, and food cooperatives, all stores which are smaller than supermarkets but still offer a variety of fresh produce and meats. Data on SNAP redemptions demonstrate the increased use of mid-sized grocers in the eight SNAP study areas. Outside of these areas, 90% of SNAP benefits are spent at large supermarkets or supercenters such as Wal-Mart or Target. Inside of these areas, however, that figure is much lower, between 50-75% when such stores are present within a neighborhood. Some of this difference is made up of corner stores and gas stations, retailers that for various reasons mainly have highly processed and nutritionally poor foods. However, mid-sized grocers also have a greatly expanded role. As table 4.2 shows, in case study neighborhoods, mid-sized grocers are the sites of 19% of SNAP redemptions in north Minneapolis and 30% in south Minneapolis. In north Minneapolis, these include four Asian markets and two discount groceries. South Minneapolis has 39 such stores. Thirty of these cater to the neighborhoods' immigrant populations, including

small grocers, halal meat markets, and carnicerias. The increased use of these stores in south Minneapolis may well be due to the vastly higher number of available food options.

Case study data also showed a significant role for these mid-sized grocers, particularly for discount grocers which, though smaller than supermarkets, offered a variety of foods at a price lower than larger retailers.[13] In both neighborhoods combined, mid-sized grocers made up 13% of all shopping trips but accounted for 31% of all dollars spent, second to only supermarkets which accounted for 49% of all food purchases. Participants often described these stores with ambivalence, noting their low prices but also questioning the quality of their foods.

In interviews, participants consistently described discount grocers as having significantly lower prices than supermarkets or supercenters. The German retailer Aldi[14] was the most common store mentioned, as it has one location in north Minneapolis and two in south Minneapolis. In north Minneapolis, another retailer, So Low Foods, also has low priced goods, often expired or near expired products or goods with damaged packaging. So Low also has a meat counter in the store, where participants can order

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[13] Food cooperatives, which also fall into this classification, were used by only a handful of study participants, who described them as expensive and somewhat elitist. Those participants who did regularly use them were white and had relatively high levels of education.

[14] Aldi stocks primarily in house brands, reducing shelf space required for multiple brands and lowering costs.

custom “meat packs” at discount prices. Leslie, a north Minneapolis resident, described the store’s offerings this way:

> You’re just saving an unbelievable amount of money going there.[….]I’ll get four pounds of bacon because it’s a $1.79 and I’ll get four or five ham lunchmeat packets because they’re so cheap. And I get a block of cheese for $10, it’s like five pounds of cheese. I go there because the prices are *really low*. They’re really low. I can go in like I spent $300 and I probably would have spent $500 if I went to Cub or another grocery store so it’s just an unbelievable amount of savings.

Mike, from south Minneapolis, said Aldi was “very limited on selection. Definitely really a lot cheaper, you get a lot more for less.” Moua, a female Hmong participant, described going to Aldi due to its proximity to her home, but also appreciated measures the store took to reduce costs, including requiring a quarter deposit to use shopping carts and charging for shopping bags.

However, participants also expressed deep ambivalence about these stores, with some participants saying they avoid them altogether. One participant described this as being “So Low-ed out.” Another man who lived in South Minneapolis but had shopped at So Low in the past because of its prices replied this way when asked if he would shop there now: “No, no. Absolutely not. My health is more important than anything else, and

if they're telling me it's outdated stuff, if I eat too much outdated stuff pretty soon I might become outdated." Brian, the white male participant mentioned earlier, refused to shop at Aldi for quality reasons, saying that "you can get a good price on a beef roast or something like that, but it's not gonna be your top notch roast or steaks. It's gonna be the bottom end of stuff. It's not the quality that I would want." Other participants acknowledged the difference in quality and taste when shopping at Aldi or So Low, but simply did a more thorough job of checking for obvious signs of mold or decay when shopping there.

Latino and Hmong participants most commonly reported use of ethnic grocers, though white and African-American participants also sometimes used them for reasons of price or perceived better quality. These stores were often "fill in" shopping in between larger trips to supermarkets or supercenters and usually was done for specific items, such as particular kinds of produce, bread, or meat. For instance, Holy Land, a Lebanese deli in south Minneapolis, was used by several study participants due to the perceived better quality of meats there and the ability to custom order particular cuts. See, the Hmong participant who also regularly shopped at the north Minneapolis Cub Foods, described using another neighborhood Asian market due to its unique produce options: "Sometimes I'll crave hot sauce or, like, sticky rice, or, like, noodles that I can't get at regular American stores[….]There's some Hmong greens that are different, broccoli greens—

they don't sell broccoli greens at American stores." These stores were seldom the primary site at which participants' procured food, but they did provide an important source of goods that in quality or selection were superior to supermarkets' offerings.

Several white participants also expressed very positive feelings about Trader Joe's, the upscale discount retailer also owned by Aldi's parent company. Katherine, a woman living in north Minneapolis, felt that while stores like So Low should be "illegal," a Trader Joe's nearby would be all she needed for her food shopping, given its combination of low prices and high quality. Similarly, Mike, who earlier complained about the poor food quality at Aldi, felt that Trader Joe's would be his top choice of a place to shop, primarily because of what he saw as the store's focus on organically produced, healthier foods. While Aldi and Trader Joe's share core characteristics, including relatively modest store sizes and a focus on in-house brands, the latter has developed a stronger brand identity when it comes to the quality of food it sells, at least for several of the white participants in this case study.

Mid-sized grocers thus played a significant but ambivalent role in providing food access according to this research. Many participants shopped at discount stores due to their low prices, but the foods found at discount markets were often seen as lower quality than those found at supermarkets or other higher priced options. Those who used discount grocers in particular exercised more vigilance on the quality of the food they purchased.

For some, this was an unwelcome bargain, and they preferred to choose stores where perceived quality and food safety was more uniform. Negotiating between these two poles entails a balancing act between risk assessment and the need to stretch every food dollar. Just as many participants chose not to utilize food shelves because they are not "there yet," the use of discount grocers in particular signals a willingness to accept less than desired food quality for the sake of its economic benefits. In this way, midsized grocers could be seen as filling in the gaps left open by major supermarkets, providing either prices, culturally specific goods, or services not available in those large stores, though often with tradeoffs related to price or quality.

4.3 Mobility and social networks

The defining metric of most spatial analyses of food deserts has been distance from place of residence. However, the data on SNAP benefit usage described earlier in his paper also demonstrate that low-income individuals can and often do travel some distance from their homes in order to procure food. Instead of treating neighborhood residents as immobile and passive, these data suggest the need for an alternative line of inquiry, one which frames individuals as active and mobile. This is not to say that individuals are able to move at will across the urban landscape. Rather, analyses of urban food access must

give attention to the different forms of mobility practiced by low-income populations, the varying ways they are able to move about the city and access the food system.

Analyzing the shopping trips of case study participants supports the need for this approach (fig. 4.4). Participants often procured food at sites outside their neighborhoods, as over half of all trips were to destinations outside the case study areas. A box plot of the distances for all shopping trips, separated out by individuals' neighborhoods and vehicle ownership, shows that the median distance of most trips was two kilometers or more, but several trips were much longer (fig. 4.5).[15] In north Minneapolis, participants with access to a car tended to make longer trips than those without one, with median trip lengths of 3,503 and 2,043 meters respectively. In south Minneapolis, these two groups were roughly equal. While those with a car consistently used those vehicles to shop for food, those without one split their trips between cars (borrowed from or riding with friends/family) and public transit. This difference may account for the different distribution of trips between these two groups, with car owners having a more star shaped network of trips and those without a car travelling in a linear fashion that reflects the hub and spoke network of public transportation away from city centers (fig. 4.4). As table 4.3 shows, the longest trips on average were made to supermarkets, fast food, and

[15] The median distances in this table differ from the mean distances found in table 4.3. The latter are affected by the skewed distribution of this data. In both cases, however, the figures show that individuals often travel outside their residential areas for food.

restaurants, with the latter two perhaps reflecting the need to use these stores when far from home.

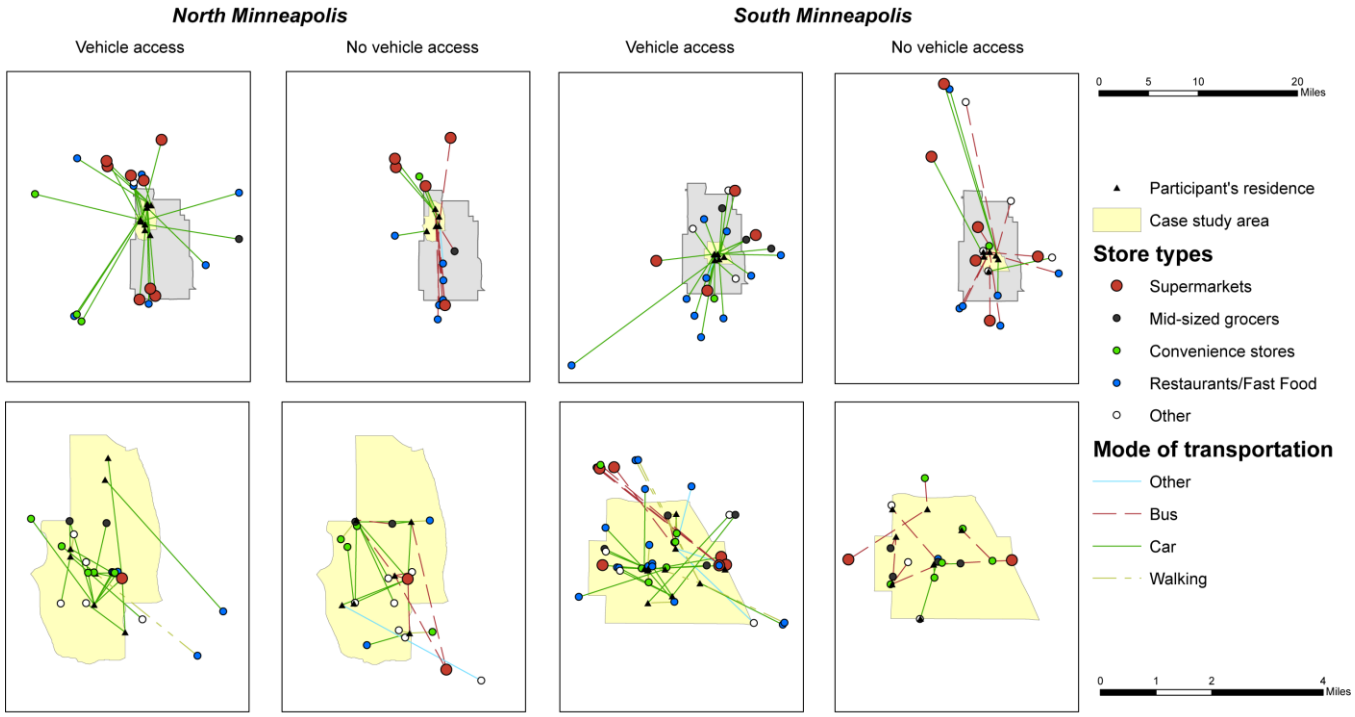

Figure 4.4: Food shopping trips by study participants, separated out by residential neighborhood and vehicle access. The top row is trips outside case study areas, and the bottom row is trips in and near case study areas. Lines are between place of residence and store/location used.

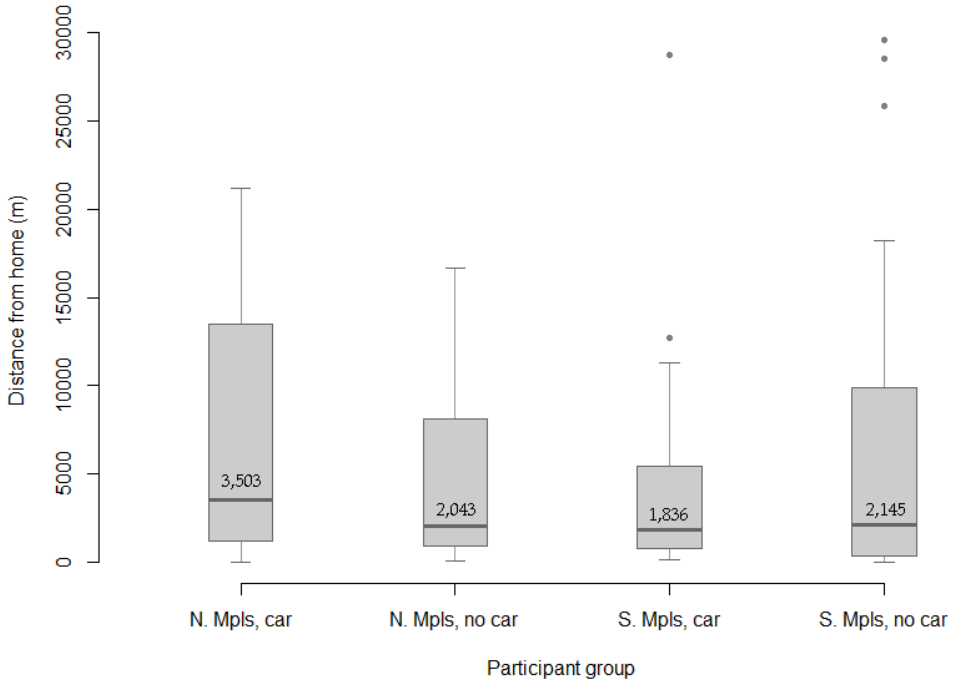

Figure 4.5: Box plot of all food shopping trip data based on participants' home location and vehicle ownership. Labels show the median trip length in meters.

The influence of public transit on food shopping destinations also emerged in case study interviews. Mavis, a participant living in south Minneapolis, was a 50 year old woman with physical limitations making it difficult for her to walk more than two blocks at a time. While the two major groceries in her neighborhood were only a five minute car ride from her home, Mavis did not have access to a car. As a result, her major grocery shopping trips were to the Cub Foods in north Minneapolis due to the fact that the bus

route running directly in front of her apartment building also stopped in front of the store. Shopping within her neighborhood would have required a transfer between buses, a trip that Mavis estimated would take approximately 90 minutes. Another woman living in north Minneapolis did her grocery shopping in south Minneapolis for exactly the same reason. The desire for a direct bus route was a prime factor shaping these women's decisions about where to shop, especially given the already onerous task of carrying groceries home by hand.

Public transit shaped food procurement in other ways. The city of Minneapolis has actively developed a network of small farmers' markets throughout the city in recent years, including several in both north and south Minneapolis. While many participants were aware of these markets, few described having used them, due to the short time they were open and the need for a dedicated trip just to purchase food there.[16] However, several participants did report using a day-long, multi-block farmers' market located on Nicollet Mall in downtown Minneapolis during summer months, since many of them transferred bus lines in that area. This proximity of this market to where many individuals were already on foot and waiting for a bus connection also contributed to its increased utilization.

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[16] The fact that these "mini-markets" did not redeem SNAP benefits was another factor mentioned by some participants, though not as commonly as operating hours and mobility issues. The fact that markets accepting SNAP sometimes doubled the value of benefits was also brought up favorably by several participants.

The alternative to public transit for those without a car was most often getting a ride with friends of family. This process can be informal and unplanned, as See, a Hmong woman, explained,

> If a friend comes over, I'll say, "Hey, what are you doing." That's how I got the ride to Cub. Then I went to the funeral, and I got a ride because family was going to the funeral[….] Northpoint [food shelf] I got a ride because I was, like, talking to my neighbor down the street and I said, "Don't you want to go to the food shelf?" And she was like, "Yeah, I think I do." So I just jumped in the car with her and went to the food shelf.

Other participants talked about a similar process for shopping at warehouses like Sam's Club or Costco, riding along with a friend or family member and making purchases using their membership. These trips, while feasible, were not always seen positively by study participants. When asked how the food system could be improved, See replied, "I would have a car." When I asked her to explain how that would improve things, she replied,

> I'm not gonna keep going back and forth, back and forth. And Northpoint, if I had a car, I would have gone on Thursday. But because the food shelf is closed Friday, I had to wait until Monday. And then the church, if I had a car, I would have just gone to eat and went home, but instead since I

> rode with someone I had to wait until they did the socializing. And that took up my whole day.

In See's case, the lack of a car did not necessarily result in a reduction in the distance she travelled for food. Rather, it added complications, stress, and inconvenience to her life, reducing her ability to get food where and when she wanted to.

Participants also spent a significant amount of time at homes other than their own place of residence. One north Minneapolis man spent several nights in a southern suburb caring for a sick sister and shopping at the supermarket close to her home. Another south Minneapolis participant, Brian, did not own a car himself but took the bus to a far northern suburb for a weekend with girlfriend, who did have a car. Using this vehicile access, he was able to eat at a TGIFriday's restaurant and do supermarket shopping in her suburban community (for which she largely paid). An African-American woman in south Minneapolis provided child care for her daughter in St. Paul in exchange for use of a vehicle to do grocery shopping. In these and other cases, a network of secondary sites provided other "homes" from which food access could be measured. The barter based economies of transportation and childcare built around partners, children, and parents thus played a key role in how and where participants got food.

Even for car owners, the vehicle did not imply fewer restrictions on their daily mobility. One participant owned a van, but it had high mileage and was often in need of

repair. See, the Hmong woman mentioned earlier, said that gas prices often determined whether people would be willing to give her a ride. Rhonda, an African-American woman, described making tradeoffs between the ability to pay for gas to drive out of her neighborhood for food and the ability to buy the food that she needed. In these cases, the financial costs associated with car ownership impacted both individuals' ability to shop at the places they preferred and to be able to pay for their food.

The results of this research demonstrate that individuals often travel outside their neighborhoods to procure food, even when their mobility might be limited by lack of access to reliable transportation. Distance certainly matters. Many participants described a desire for better food sources closer to their homes. At the same time, even those without vehicles were not constrained to food options close to their place of residence. Instead, drawing on informal social networks, participants were able to travel significant distances to do their shopping. This mobility comes with a price, however: the loss of autonomy in deciding when, where, and how long shopping takes. Residents' use of public transit also had significant influence over the location and type of food sources they used, favoring sites near direct bus lines and transit hubs. Thus, the question should be not whether mobility plays a role in shaping food access, but rather the understanding the various ways that mobility is shaped by individuals' capacity to leverage social networks, economic resources, and transit infrastructure in their everyday lives.

5 Discussion and next steps

Conventional spatial analyses of food deserts have received significant media and political attention in recent years, but this research shows that these analyses are problematic in a number of ways. Though most analyses treat supermarkets (and less commonly groceries) as uniform proxies for access to healthy, affordable foods, both SNAP data and this neighborhood case study demonstrate that supermarkets are far from a uniform classification in the minds and practices of urban residents. Differences in price, food quality, customer service, and neighborhood context all make suburban supermarkets a generally preferred shopping destination over central city supermarkets. Certainly, residents still use their local stores, but they often also seek out more appealing options, often in suburban locations. Of the 62 trips made to supermarkets by case study participants, only 23 of those (37%) were made to stores within a mile of participants' case study neighborhood, 26 (42%) were less than 3 km from participants' homes, and 37 of them (60%) were within the city boundaries of Minneapolis or St. Paul. From an analytical perspective, this trend complicates dichotomous ontologies of classification. One cannot separate a supermarket from its neighborhood context. This runs counter to current spatial analyses which fail to factor in neighborhood influence on the ways stores are perceived, in part due to the ways software favors discrete, easily classified objects. It

may be better to conceive of these stores as assemblages, constituted by food distribution networks that are sensitive to neighborhood composition and a labor force often drawn from the surrounding community among other factors. Doing so might mean enhancing market basket style studies to research the distribution networks and workforces of supermarkets across a metropolitan area and the differences at the store level that result from these factors. Urban supermarkets are also unavoidably embedded in a neighborhood context and its racial and class based segregation. More practically, initiatives such as those in Chicago, New York, and other U.S. cities that incentivize supermarket creation in low income communities may not be as effective at providing food access as their supporters claim.

Similarly, a distinct minority of research in this area has studied the role of discount and ethnic retailers in urban neighborhoods, though these stores were a common shopping destination among case study participants (see Short et al., 2007 as one exception). While residents prize discount stores particularly for their low prices, they also expressed concern over the quality of goods found at these locations. Ethnic retailers provided specialized goods, but at a higher cost. Taken together, the relatively large role these store types played in residents' food purchasing suggests the possibility of a more diverse urban "foodscape," decentering planning efforts focused only on filling the "grocery gap" (Ashbrook & Roberts, 2010; Duffy, 2011). Considering these other

options, along with even less visible alternatives including food shelves, gleaning projects, community gardens, and mobile markets, opens up other pathways of urban redevelopment not focused on large retailers. Integrating these food sources into GIS based analyses is more complicated due to limited hours, seasonality, or lack of a fixed location, but may be worth pursuing given their potentially significant role in providing healthy foods for low-income areas. Put another way, the foodscape of low-income neighborhoods need not be painted in black and white terms, healthy and unhealthy food options. Rather, food stores require more nuanced classification, shades of gray that recognize both variations within categories, as in the case of supermarkets, or the ambivalent role of smaller stores which are often left out of existing analyses.

Lastly, this research emphasizes that food access is less about proximity of food sources than their relation to residents' everyday mobility. Strengthening access thus may require coordination with broader efforts for transit oriented and mixed use development. While large grocers have locations that are fixed, concentrating bus lines around these locations may be one way to improve food access. More importantly, for smaller sites like mobile markets or farmers' markets, finding locations near transit hubs and providing more extended hours may be more effective than opening a broader range of smaller hubs with short hours, less selection, and poorer transit access. Larger market sites would also be better able to purchase equipment for redeeming SNAP and WIC

benefits than smaller locations. In winter, facilities that allow for indoor farmers' markets, especially when located near transit hubs, may also improve access for healthy, sustainably grown foods. At the same time, given the informal transit arrangements made by many study participants, centralized transit planning may also be supplemented by "pop-up" food infrastructure, more flexible temporary arrangements that allow for local residents to experiment with alternative, everyday urbanisms of food production and distribution (Bishop & Williams, 2012; Chase, Crawford, & Kaliski, 2008). These approaches might better align with the social and spatial factors shaping food procurement (Koch, 2012).

This project is, of course, limited in scope, focusing on cross sectional data from a single U.S. metropolitan area. Similar research in other urban areas with different urban forms and transportation networks would provide a useful comparison. Participants in the neighborhood case study were also relatively old, with an average age of 45, and it is possible that a different set of participants, especially younger ones, could render different study results. This research is also limited in scale, focusing primarily on one metropolitan area and two urban neighborhoods most specifically. Further research drawing connection between the "foodscape" of these and other study areas and broader policy issues (e.g., crop subsidies, zoning patterns and tax structures) may also prove useful.

These limitations aside, this project provides ample evidence for rethinking current research approaches to food deserts. Mixed methods approaches may include unresolvable epistemological tensions, such as the need for clear store classification schemes against recognition of the heterogeneity of stores within each class. A top-down, centralized approach to transportation planning also contrasts with the often spontaneous mobility habits low-income populations in this study, ones that rely on a geographically diffuse social network. Still, in navigating these tensions, the research presented here does suggest that the work of addressing food insecurity and improving food access must entail more than increasing the food supply to low-income neighborhoods, especially the creation of new supermarkets. This study demonstrates the diversity of urban food systems and the ways they are used by urban residents, as well as the notable mobility of even those without vehicle access. This also suggests the need to make connections between food desert work and related efforts for mixed-income, transit friendly development. By recognizing and building on the everyday practices and mobilities of urban residents, and including their voices alongside existing spatial analyses, work in this area may be better able to ameliorate health problems caused by poor food access and aid in the creation of more sustainable, healthier communities.

Chapter 5:

Conclusion

5.1 Summary of findings

Current spatial analyses of food deserts have succeeded at bringing political and media attention to inequities in food access and food security in low-income neighborhoods. In many cases, this research has documented real discrepancies in the urban food retail landscape, one of many ways the flight of both middle class residents and retailers catering to them has impacted core urban neighborhoods. However, the analytical focus on food supply has left significant blind spots in the ways studies conceive of and study food deserts. By prioritizing the need to improve food choices in low-income areas, food desert research is easily cited by large retailers, such as Wal-Mart and Target, who can use their abundant supply of cheap produce as an argument for expansion into urban markets. Residents of food deserts are figured as passive consumers in need of places to shop, with little political or personal agency. Food deserts themselves are mapped as neatly bounded and pathologized spaces closed off from an otherwise functional food system.

By shifting the analytical focus from the food supply to the procurement practices of urban residents, this research project reimagines food deserts as relational spaces, not

discrete entities. It highlights how supermarkets do not exist independently from their neighborhoods, but are associated with them in a number of ways: in the clientele they serve, the workers that labor in the stores, and the quality of foods they receive. Similarly, smaller stores, including both ethnic and discount grocers, play an ambivalent role within these neighborhoods. The former provide specialized goods to immigrant populations specifically, but with less selection than major grocers and higher prices. Discount grocers offer lower priced items but with less selection and lower quality. My case study participants seldom relied on just one of these store types for food. Rather, they were constantly comparing, making trade-offs between the relative merits of each store in relation to their own needs and resources. In that sense, these stores all exist in a an ecological web, though this suggests a naturalism that does not correspond with the impact of various zoning and housing policies, private investment strategies, and broader consolidations within the food industry, all of which have shaped the food options available within these two neighborhoods. While this dissertation has lacked the space to address these issues, they shape the "power-geometry" of these neighborhood retail landscapes and deserve fuller exploration in food desert work (Massey, 1993).

By highlighting the mobility of urban residents, this research also questions the territorialization of food deserts, the work to map them as geographically discrete spaces. The results of this research demonstrate how residents of low-income neighborhoods,

even those without vehicle access, consistently travel outside their communities as part of their daily life. In many cases, these trips are motivated and enabled by relationships with friends and family in other sections of the city, providing a social network that defines the boundaries of individuals' everyday lives. This result, along with other research showing similar results, belies the insistence that residents of food deserts are somehow trapped within their neighborhoods (Ledoux & Vojnovic, 2012; Zenk et al., 2011). Rather than ask *if* low-income residents are mobile in finding food, a better question to ask would be *how* they are mobile, how the networks they draw upon to do everyday tasks such as food shopping enable or constrain the paths they choose as they travel. The latter framing emphasizes the need to more fully consider the role of public transit systems and other such networks of mobility in shaping the ways individuals access the food system.

This study does have several limitations. Both SNAP and case study data are for one metropolitan area and are cross sectional, meaning that they offer only limited ability to generalize across times or differing urban contexts. Additional research built on these findings could assist in this issue. The participants in my case study were more than a decade older than the median age for the neighborhood, which may have biased results. SNAP data, especially at the store data, is a weighted estimate, and this analysis would be stronger were the USDA to allow for even restricted access to store level data. SNAP data is used here as a proxy for overall food shopping, a working assumption that is not

necessarily valid. SNAP client demographics do not map directly onto those of low-income populations. Latinos, for example, are generally under-enrolled in this program. Still, the correspondence between analysis of SNAP data and the case study findings does provide some support for this approach.

That said, the shift from proximity measures to a focus on practice, emphasized in this project, reframes the ways we study food access in low income communities. Rather than providing financial incentives for food retailers, this work points to a need to give attention to and better support the daily mobility of low-income individuals. It opens up the space of food deserts, showing both how residents often travel outside these areas to get food and also how the stigma, segregation, and disinvestment which characterizes these areas problematizes interventions based only on the creation of new retail. While the results lack the crisp definition of conventional analyses, they also demonstrate how work to improve food access may find common ground with activism around urban transit and livable communities.

5.2 The tensions of mixed methods

This research used a mixed methods approach, with the goal of drawing on the strengths of both quantitative and qualitative approaches. The two phases of my research project had several areas of agreement, including the mobility of low-income

populations, the relative underuse of neighborhood supermarkets, and the more prominent role of mid-sized grocers within these neighborhoods. In each of these cases, these methods were strong complements for each other, with data on SNAP utilization providing evidence for broad scale patterns and case study research providing explanatory factors explaining or better describing those patterns.

However, the goal of mixed methods work should also be to highlight "gaps and tensions between differing forms of knowledge" (Elwood, 2009, p. 99). Explicitly recognizing these tensions points to the limits of each approach and the epistemological blind spots and biases implicit in their use. One such tension in this project has been the need for store classification, common to GIS based analyses, against the recognition of substantial variation within each class. Classification was an essential part of my analysis of SNAP data, since creating store level estimates would have been impossible without it. In more conventional distance based analyses of access, store classification plays a similarly key role, with supermarkets (and sometimes smaller grocers) acting as proxies for healthy food access. In practice, however, I found that the dividing lines between store types were not always clear. How much produce and meat should a store carry in order to be classified as healthy? Are dollar stores, which often had several long aisles of processed foods, really equivalent to much smaller corner stores and gas stations? As my case study participants made clear, even supermarkets varied significantly from location

to location. This issue is even more acute when one considers other "gray spaces" rarely included in analyses of food access: community gardens, food trucks, and food shelves. Each of these sites may have widely varying selection and food quality. Balancing the need to classify and place value upon certain food sources against the recognition that these sources can and do vary was one vexing analytical and policy question arising through this research.

Another core tension between these approaches was the difference in view between, as de Certeau (2000) frames it, the skyscraper and the street. Data from the SNAP program provides an invaluable perspective on spatial patterns of benefit utilization as a proxy for all food shopping. Similarly, when case study data demonstrate that public transit often plays a key role in the food shopping trips of individuals lacking a vehicle, it seems logical to suggest forming transit hubs around major food sources. These "top down" views of the urban food system contrasted with participant accounts of the often informal and unplanned ways people secured transportation or shopped for food. These trips were shaped significantly by social networks, which varied greatly in location and extent. This tension is familiar to those who have worked in public participatory GIS, where localized accounts are balanced against broad datasets, with varying degrees of commensurability. In practice, I have advocated for the need to hold these two views in tension—designing solutions based on broad data on current usage while also providing

more flexibility for grassroots design and food system building at the neighborhood scale. Still, this is another tension lacking easy resolution.

Lastly, this research navigates tensions between thinking of neighborhoods as territories or as nodes in a network. The former is a much more conventional view for GIS-based research, and in my analysis of SNAP data I found it necessary to draw boundaries around high use areas in order to understand what was going on within them. However, as both SNAP data and my case study data makes clear, these boundaries by no means contained residents or their daily activity. I asked each case study participant to outline what they saw as their neighborhood as part of our final interview, and these boundaries were seldom closely aligned with other participants or with my study. In addition, the stores within each study neighborhood obviously have connections to much larger networks of food production and distribution, making a focus only within neighborhood boundaries highly problematic. That said, it was clear from my research interviews and in broader literature on health effects that neighborhoods do matter. Residents had definite opinions about nearby stores, whether they used them or not, and feelings about the neighborhood were a key factor shaping decisions about when and where to shop. Knowing how to balance the need to identify specific areas of analytical interest against a treatment of them as relational, networked, and dynamic is a task health geography and other fields is only beginning to take on (MP Kwan, 2012).

Each of these tensions lacks easy resolution. Certainly, even several decades since de Certeau wrote “Walking in the City” or Haraway wrote of the need for situated knowledge (Haraway, 1988), the analytic view made possible by broad scale data analysis retains its cultural and political power. This project is not intended to discount the value of this approach, but it does demonstrate the need to recognize its limits and balance it against other epistemologies.

5.3 Future research and concluding thoughts

This dissertation project suggests alternative paths for exploring the geographies of food access, but is necessarily limited in scope. Future research building on this project could follow in a number of directions. As noted throughout this project, data on SNAP utilization has rarely been analyzed at the neighborhood level, even though it has obvious value for understanding patterns of food access in low-income communities. Restrictions on the public release of data and the multiple layers of administration within SNAP make it a difficult program to study, and as a result most analysis of SNAP is done by firms hired by the USDA. This dissertation has shown how these data can be made usable at a fine scale, and future projects could build on this work by examining what SNAP data show about food access in a number of different urban contexts, particularly those that vary in density, transit networks, and levels of segregation. Longitudinal data on SNAP

usage would also provide the opportunity to measure the impact of new large retail developments on both neighboring businesses and on the flow of benefits out of low-income neighborhoods. Similar studies could be conducted to understand how changes in transit, such as bus route realignments or the opening of new light rail lines, impact food shopping behavior. Recent efforts in a number of cities have been focused on increasing the number of farmers' markets receiving SNAP benefits, and these data would also speak to the effectiveness of these efforts. These natural experiments would provide more insight in understanding how people navigate differing urban environments to get food, as well as showing who profits from the program and broader efforts to improve food access.

While this dissertation emphasizes the mobility of low-income populations, this is not to say that there are real differences in mobility across class lines. My participants often described weighing gas and maintenance costs against food prices in their decisions about how and where to shop. Other participants who lacked a vehicle cited the inconvenience of having to call upon others for rides or adjust to their schedule. Future research might focus on the opportunity cost of various mobilities and how it impacts participants employment decisions and childcare strategies (Rogalsky, 2010a provides one example of such research). Work on food deserts might borrow from existing work on activity spaces and space-time geography to reconceptualize neighborhood spaces

around the daily mobilities of their residents. Such an approach would define neighborhoods not only through their internal characteristics but through their connectivities with other sections of the city through labor markets and transit/social networks. Cummins et al. (2007) have called for such a "relational" approach, but this remains an under-researched area.

This dissertation also is an initial summary of research findings. The case study data summarized here allow for analysis of how food procurement differs across neighborhood, ethnicity, and gender. While some of these differences are reported here, such as the use of ethnic retailers among immigrant groups or the particular dislike of north Minneapolis for their neighborhood Cub Foods, ongoing analysis will continue to focus on how the three areas listed above may matter in everyday food procurement practices. At the very least, this future research might point to the need for differentiated strategies in improving food access based on the particular sets of limitations or unique assets possessed by various groups. Similarly, while the three articles contained in this dissertation provide only passing attention to photographs taken by study participants, future work will analyze how these photographs provide another perspective on the food and food sources used by participants.

Lastly, analysis of interventions designed to address food deserts might examine how businesses use this research to justify new food related enterprise in low income

communities. This research might involve ethnographies of particular initiatives, such as the Pennsylvania Fresh Food Financing Initiative or Wal-mart's expansion into Chicago ("Pennsylvania Fresh Food Financing Initiative," 2011; Warren, 2010). Longitudinal data on business locations in one or more metropolitan areas would provide another view on this issue. Several cities have debated changes to zoning structure to facilitate the spread of urban farms and/or community gardens, and the effects of these planning projects, and their relation to broader efforts to improve food access (such as healthy corner store projects or new supermarket creation) are also worthy of study.

At the close of this dissertation, I have ambivalent feelings about the future of food deserts. They have certainly mobilized a significant amount of action around the problems of economic disinvestment and food insecurity in low-income neighborhoods, receiving attention at the highest levels of government and from several major non-profit groups. At the same time, the fundamental assumption of much of this research—that residents of food deserts are passive consumers who need better places to shop—disempower communities and often lead to subsidies for large retailers, rather than addressing issues that more fundamentally impact the lives of neighborhood residents. My approach has been to embrace this tension—leveraging the political currency of this terminology while also attempting to help redefine it. However feasible such a task may be, this dissertation has tried to show that action to improve food access is inextricably

tied to other core urban issues: transit networks, economic and residential segregation, and retail landscapes primarily designed for suburban consumers. Fixing food deserts, however they may be defined, must engage with these issues if real progress on building healthy communities is to be the goal.

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